THE MODEL ENGINEER

Vol. 94 No. 2345 THURSDAY APRIL 18 1946 6d

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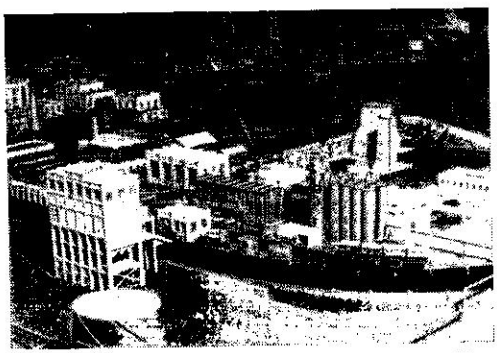

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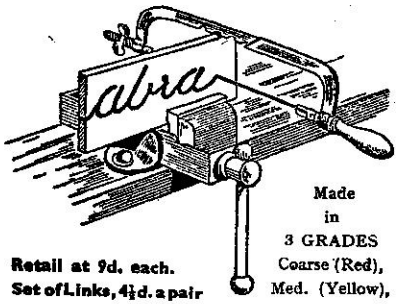

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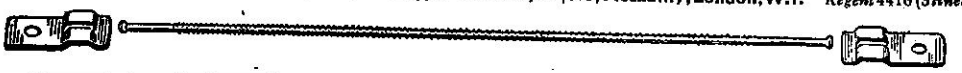

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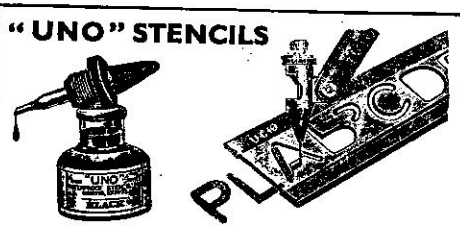

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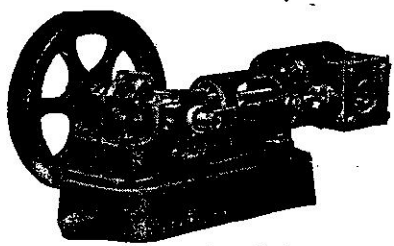

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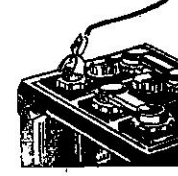


THE MODEL ENGINEER

APRIL 18th, 1946

VOL. 94. No. 2345

Smoke Rings

Outdoor Prospects

THE coming summer season is likely to see a very general resumption of outdoor activities by model engineering clubs. The boating clubs have been carrying on very quietly during the war period, but regattas and speed-boat contests have been very few in number. A good deal of boat and engine building has, however, been carried out, and we may hope to see some new racing records set up as the months go on. Locomotive passenger tracks will be seen in many places, always attracting the crowd and delighting the passengers as well as the enthusiasts on or behind the foot-plate. It is rather surprising how many clubs have acquired either a permanent or a portable track, and I am sure we shall hear a great deal more this year about the popularity of the miniature railway at holidays-at-home and other local pleasure functions. By what I learn from club secretaries, there will be no lack of locomotives to provide the live-steam.

Electricity *v.* Live Steam

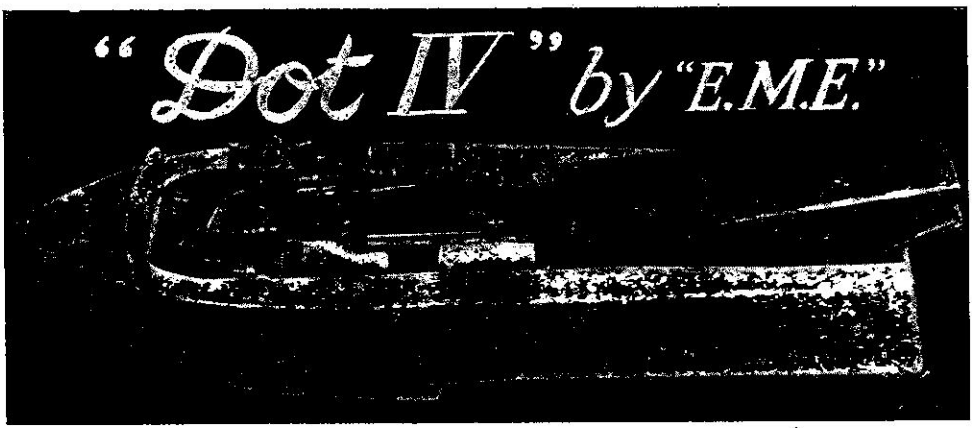
A CORRESPONDENT comments on the tendency he has noticed among some of his live-steam friends to decry the electrically-operated steam-outline type of locomotive, on the ground that it is only an imitation of the real thing. Quite rightly, he says that this is not in keeping with the tolerance for individual preferences and needs which should prevail among model engineers. I think my correspondent has probably come across one or two cases of extreme enthusiasm for live-steam, enthusiasm which I can quite undertand, and the criticism of electric propulsion has been made in a thoughtless moment without any real consideration of the facts of the case. The truth of the matter is that both types of engine have been designed and made with a very different purpose in view. The electric steam-outline locomotive is mainly intended for indoor operation in the smaller gauges, for which purpose it is eminently suitable, and for many reasons it scores heavily over its larger all-steam relative in this particular field. Apart from its convenience and cleanliness of operation, it is well-suited for super-detail modelling, and admirers of famous prototypes in the real railway world can possess and run realistic miniatures to their heart's content. The all-steam locomotive is a different kind of animal, particularly when it reaches passenger-hauling proportions, and must be considered and admired from a very different point of view. The true model engineer may be a specialist in some particular kind of work or type of model, but I have always found him ready to appreciate the view-point and the fancies of his fellow hobby enthusiasts, and always able to admire good craftsmanship for its own sake. What a dull world this would be if we all thought and acted alike. Model engineering would, indeed, be in a groove, and where would be the fascinating traction engines, petrol motors, speed-boats, racing cars, beam engines and the hundred and one different productions of the home workshop which give such delightful variety to our hobby.

How Many Models?

IT would require a very clever statistician to calculate with any exactitude the number of models which exist in this country. As a very rough-and-ready approximation, let us assume that a thousand models are completed every year. In this assumption I would include the work both of the trade and the hobbyist, but would exclude the many simple types of models which belong to the class of toys. Model making has, of course, been actively practised for very many years, but taking only the period covered by the existence of THE MODEL ENGINEER, this rough estimate would account for between forty and fifty-thousand models. To pursue this speculation a little further, let us ask to how many people have these models given pleasure, either in the making, or the inspection, or in the working? If we put the public per model at the modest figure of one hundred we can claim that at least five million people have been interested and entertained in some way by models of some kind. When we take into account the thousands of folk, young and old, who have been thrilled at speed-boat and sailing regattas, at model aero field days, at passenger-track demonstrations, and at the many club and other exhibitions, the probable total is no doubt far greater than that suggested. If models can contribute to human happiness, even at this very moderate estimate, we have one more answer to the old-time question—What is the use of model engineering?

Percival Marshall

"Dot IV" by "E.M.E."



THE flash-steam hydroplane "Dot IV" is the logical outcome of experiments on "Dot III," (described in THE MODEL ENGINEER, January 4th, 1945). The maximum speed of "Dot III" was quite satisfactory, but reliability was sadly lacking, so I have aimed at getting more dependable running with "Dot IV," even at the expense of a few m.p.h., if necessary.

Engine

This was the first subject for experiment. The old engine could give the power output required, but the sprawling mass of gearing that formed the pump drive, and the "oversize pump" were rather an eyesore. I re-designed the whole crankcase, incorporating brackets for the water and oil pump mountings, as shown in the drawings. The flywheel, which overhung the rear end of the crankcase in the old engine is now supported between the main crankshaft bearings, which makes the engine more compact and lessens the effect of any lack of balance in the flywheel. As the previous crankshaft had worn rather badly, especially at the main bearing, this was provided with a ball race, and the plain tail bearing increased in diameter. The shaft was built up instead of being machined in one piece, as it was easier to correct any distortion after hardening in this way. The shaft itself was only hardened at the tail bearing; the crank disc was hardened throughout. The method of machining the crankpin may be of interest—it gives a perfect result in quite a simple manner (see sketch). A tiny roller-race is fitted to the big end. I expected trouble here, but was agreeably surprised by the subsequent performance. The roller and ball-races were fitted to resist wear, rather than to reduce friction losses. The same type of valve-gear has been retained, but the cam has been made larger, as the cam of "Dot III's" engine showed signs of excess wear and had developed a crack as well. The valve cylinder and power cylinder were made in H.S. steel this time, as the previous cast-steel cylinder had turned blue at the top and had scored badly where the temper had been drawn too far. A small crescent-shaped lug was fitted to the flywheel to help pull the piston-valve down as it sometimes stuck up at the top position; this has now been removed for reasons to be explained later.

Water Pump

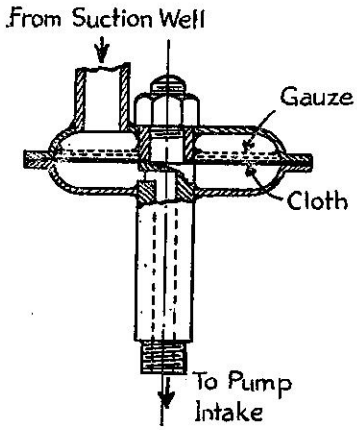
In my last article of "Dot III," I broadcast an appeal for small stainless steel balls; the kind assistance I received from about half-a-dozen readers of THE MODEL ENGINEER enabled me to produce a water pump more in keeping with the size of the engine. The new water pump for "Dot IV" is $\frac{1}{16}$-in. bore, stroke indefinitely variable from 0 in. to 0.2-in., all the valves being $\frac{1}{16}$-in. diameter balls. It is geared 6 : 1 from the main crankshaft the pump crankshaft being given a slight "De Saxe" setting to reduce the angularity of the connecting-rod during the power stroke. The water filter consists of a small disc of 140-mesh gauze, backed with cloth (see sketch).

Oil Pump

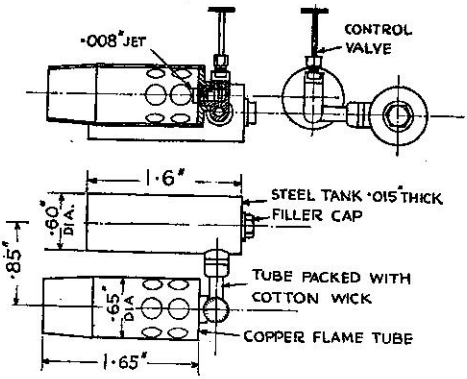
The oil pump of "Dot III" was retained for the first few runs of "Dot IV," but now a new pump has been fitted. The main reason for this was that the valve seats of the old pump had not sufficient metal in them to allow of reseating the balls without distortion, and the foot-valve seating cracked during the operation. The drawings of the engine were produced before the new pump was fitted, the photographs show the new pump, also certain modifications to the water-pump.

Blowlamp

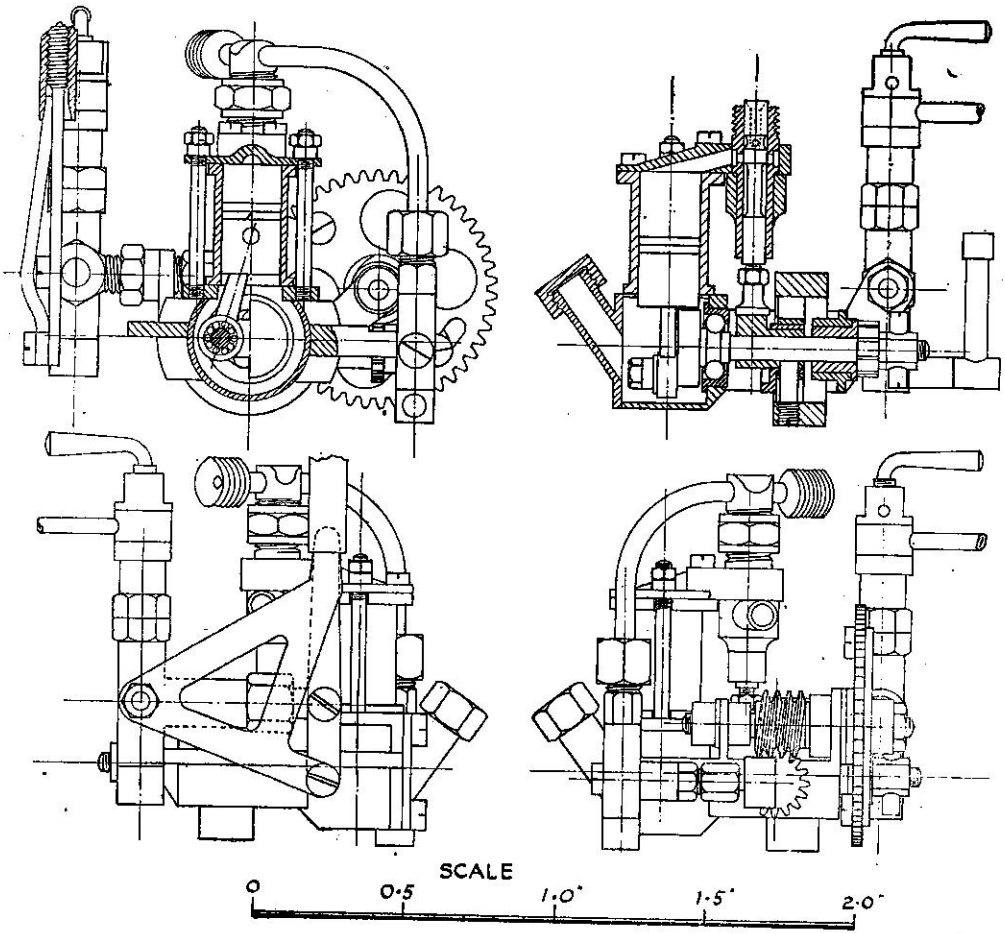
After many experiments with petrol burners of the normal pressure-fed vaporising type, I thought it might be worth while to try the system used on the small petrol plumbers' blowlamps. I made up a tiny burner 0.3-in. diameter × 0.8-in. long, with a petrol tank, $\frac{1}{2}$-in. diameter × 0.9-in. long for another small steam plant, and fitted a needle-valve to the jet. Results were so reliable with this tiny lamp, that I made a slightly larger one on the same design for "Dot IV." The valve control in this case was not fitted direct to the nipple, but at right-angles to facilitate control *in situ*. I think that I can now say that blowlamp troubles are really over. The control of the flame is excellent, surging is almost completely absent, no pumping up is required, the whole of the tank can be full of petrol as no air space is required, and the nipple does not get blocked, as the wick acts as a filter. The simple solution, after



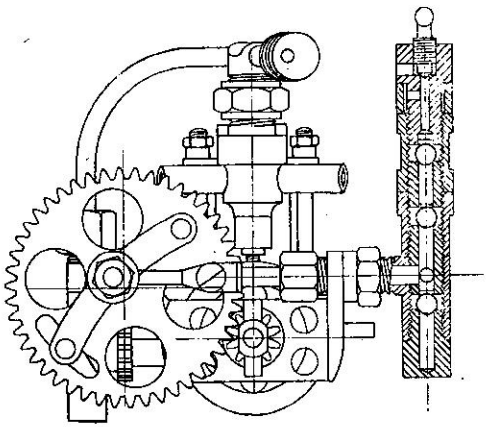
Section through water filter

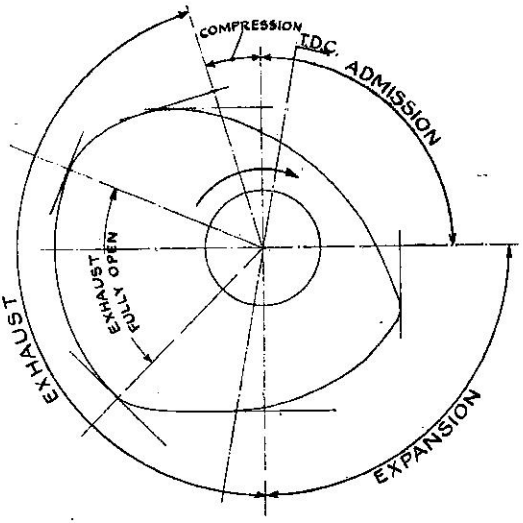


Blowlamp for "Dot IV"



General arrangement drawing of the engine for "Dot IV"





CAM AND TIMING DIAGRAM.

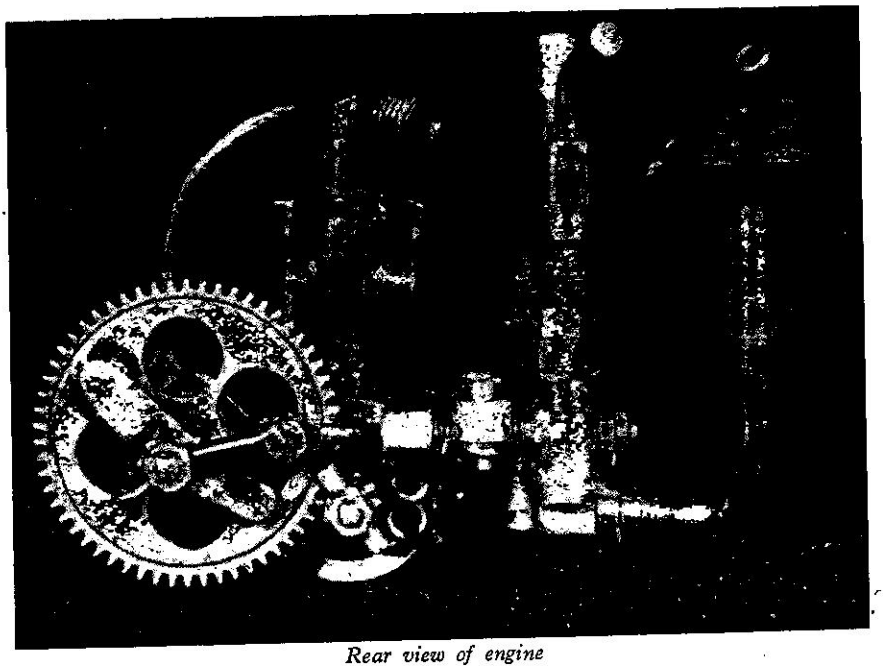
spending hours in experimenting with pressure-fed vaporizing burners.

Boiler

I had used " home made " steel tubing for the boiler of " Dot III " ; and after having re-wound the coils a few times, they looked a bit kinked. were made of steel, but copper seems to stand up pretty well. Brass doesn't, as I later discovered.

Hull

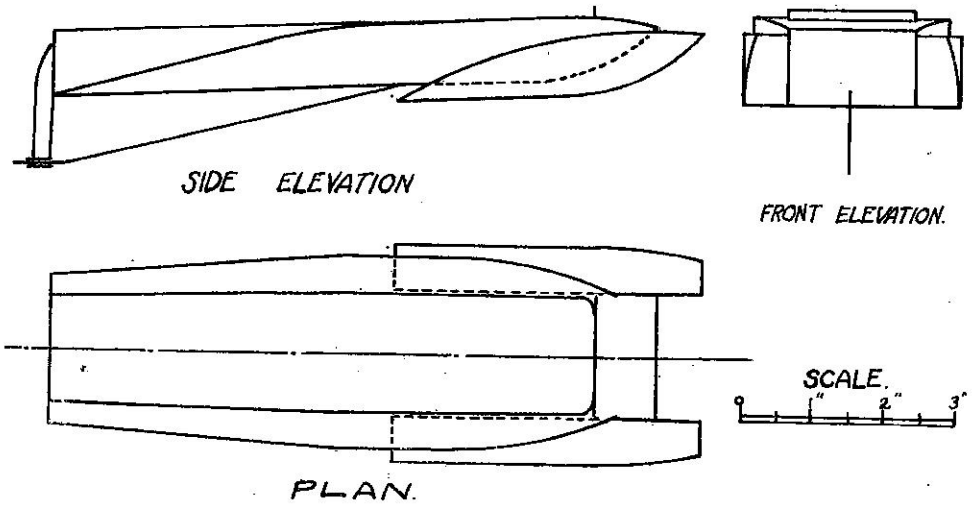
The first hull made for " Dot IV " had two sponsons in front and a narrow transom with



Rear view of engine

I was able to obtain 3/32-in. copper tube and $\frac{1}{16}$-in. brass tube by the time " Dot IV " was in progress ; so the next boiler consisted of 3-ft. of each in series. I originally used steel tubing because all the flash boilers I had read about " streamlined " sides. Thus hull was made of wood and weighed about 3 oz. complete—rather heavy for its size.

Two more hulls were then made for the engine, the first made from 0.002-in. brass foil on a



First hull for "Dot IV"

piano wire framework, was a normal scow-type, 9 in. long, weighing just under 2 oz. Lateral stability, however, was lacking rather badly. It would probably have been possible to improve the stability by means of sponsons, but the idea occurred to me that, if I used sponsons, I might as well make the hull itself as narrow as possible for lightness and reduction of skin friction. The next hull was made of 0.002-in. steel foil, 2 in. wide at the front, tapering to 1¼ in. at the stern, 9 in. overall length. The fuel tank was set crosswise in front of the burner to suit the narrow hull. Two trial sponsons were cut from tinplate to support the front end. The first trial run was really ludicrous. The sponsons left the water completely, and the boat went careering round at about 8 m.p.h., supported only on the rear plane, a surface of about 1 in. × 1¼ in. only contacting the water, the boat itself at about 25 degrees to the water surface—an entirely new type of "hydrobatics" to me.

By this time I had had enough of freak hulls. The final hull for "Dot IV," I decided, was to look like a boat, and not a "flying shovel." This hull was made from $\frac{1}{16}$-in. three-ply, with one ply removed, the concave V front being formed by steaming and bending. After experiments with metal/foil, it seemed that the lightest and most rigid hull in this size is far more easily made from wood, as thin foil is difficult to solder without forming large "blobs." The hull was finished off with blue cellulose paint.

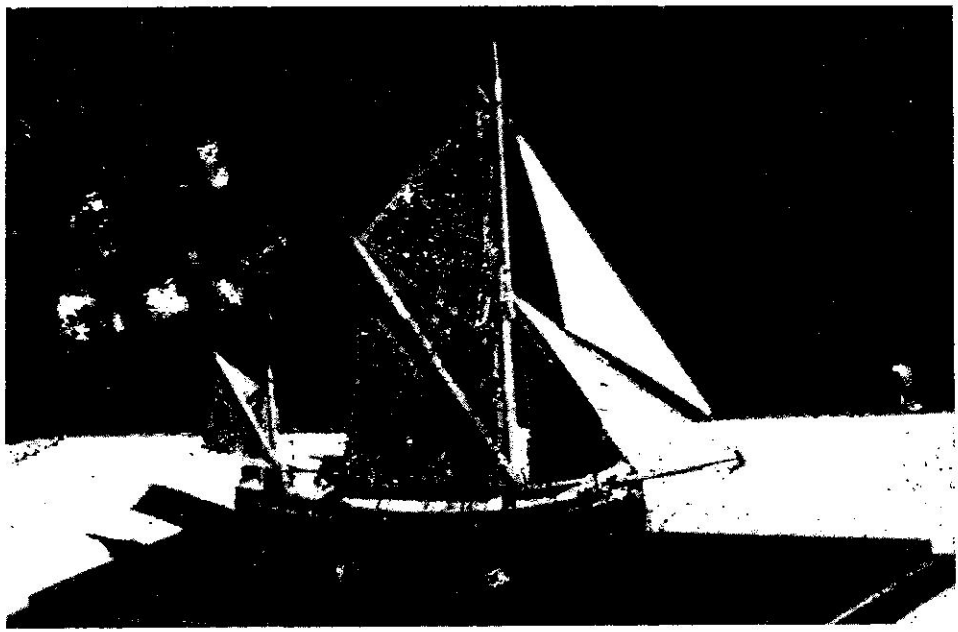
Engine Troubles

One of the troubles encountered was the result of fitting the "pulling-down-cam" on the flywheel. On one occasion when the boat nose dived, the valve was sucked up to the top position and the offending fixture snapped off the cam follower. So I had to make a new valve and dispense with the "pulling-down-cam" to avoid a repetition of this occurrence. Now, if the valve sticks up it has to be released by hand again. This does not occur very often, however, and is preferable to making new valves anyway. Another strange characteristic of this engine design is that it will start itself if set with the crank about 30 degrees *before* T.D.C. owing to the reaction of the valve on the cam, although this hardly constitutes a "trouble."

(To be continued)

A Model Thames Sailing Barge

By E. J. CHING



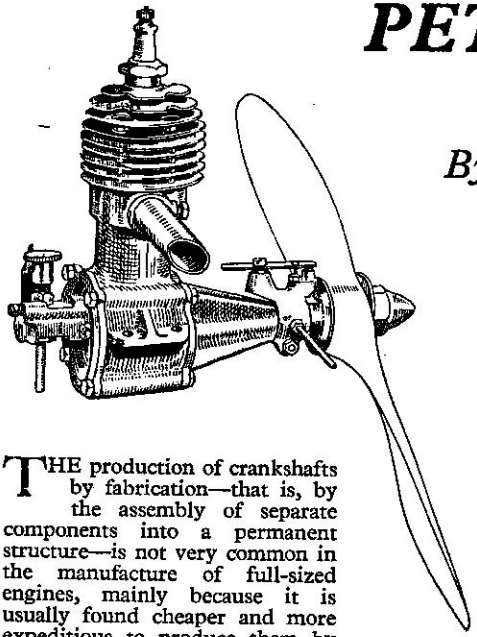
A $\frac{1}{16}$-in. to 1-ft. scale model of the Thames sailing barge, "Lady Daphne"

THE photograph, herewith, shows a model of the sailing barge, *Lady Daphne*, of Rochester, which I built from blueprints supplied by H. A. Underhill, scaled down to $\frac{1}{16}$ in. to 1 ft. making the hull $5\frac{3}{4}$ in. long and the height to truck $6\frac{1}{2}$ in. The hull was carved from a piece of whitewood, the stem and stern posts were added after. The bulwarks were then cut from thin plywood, also the outer wale. The hatches, cabin skylight and companions were made from a piece of mahogany, and the rudder and lee-boards from ply, the iron strapping being represented by strips of card glued in position. I made the masts and spars from dowel, rubbing them down to the correct shape and diameter; card was used for building up the tabernacle. The drums for the trail and lee-board winches were punched from cardboard with a hollow punch of the correct diameter, and the frames were made up with wire and card. The windlass was a tricky job, the cheeks were cut from $\frac{1}{16}$-in. ply and the barrel from a length of dowel. The large gear-wheels were made up from copper wire, the absence of teeth in such a small model are not noticed. After a good deal of experimenting with various materials, I finally cut the sails from good quality notepaper, with thin strips of the same material glued round the edges to represent the seams; this also prevents the sails from curling unevenly. The brown sails were given a coat of poster colour of the correct shade and have a nice matt finish; an extra coat on the weather side gives them a realistic bulge. The white headsails were treated in a similar manner; the mast hoops for the top-mast were made from brass wire coiled round a steel knitting needle, to form a spiral and cut off with a sharp knife. I used various gauges of thread for the rigging after it had first been dyed and waxed. For the ratlines I cut off lengths of bristles from a hairbrush and glued in position across the shrouds, afterwards staining them down. The anchor was another problem. I finally built this up from pieces of wire cut to length for the shank and stock, the flukes being cut from a piece of scrap brass, the whole being soldered together in a jig. The steering wheel was made in a similar manner but using copper wire. The hull is finished in semi matt model aeroplane "dope," which gives the model a very pleasing appearance.

PETROL ENGINE TOPICS

By EDGAR T. WESTBURY

* Methods of Making Crankshafts



THE production of crankshafts by fabrication—that is, by the assembly of separate components into a permanent structure—is not very common in the manufacture of full-sized engines, mainly because it is usually found cheaper and more expeditious to produce them by other methods, in cases where they are required in large quantities ; but this method is often practised, with more or less success, in the construction of model petrol engines. There is a choice of several methods of fabrication, the selection of which depends on the materials used, and the facilities available.

Fabrication by Shrinking-on

This is a perfectly sound method of crankshaft construction, provided that the fit of the mating components is correct, and that the procedure adopted enables them to be brought quickly into assembly position, before any substantial interchange of heat between the parts can take place. On both counts, it is much easier to handle large components than small ones, and for this reason, only limited success has been obtained with this method at the hands of model engineers.

It is well known that the crankshafts of large marine engines, both steam and I.C., are often fabricated by shrinking-on, and I believe that this method is, or has been, also extensively employed in locomotive practice, though I cannot speak from experience on this point. Some years ago, I saw the crankshafts for large marine diesel engines being made by this method. The crank webs were locally heated at the eyes by means of an oil-fired furnace, and the journals or crankpins held vertically in an assembly jig, so that the webs, after heating, could be lowered on to them by a crane. It was interesting to note that they literally fell into place, and could be manipulated to correct alignment errors before they cooled sufficiently to grip the shaft. Speaking from memory, I believe the shafts in this particular case were about 15 in. to 18 in. diameter.

In the construction of a small crankshaft by this method, conditions would be totally different. Owing to the very rapid conduction of heat from one part to another as soon as they came into contact, it would be necessary to assemble them very quickly, and no shifting of their angular position would be possible, once they were in place. Some kind of an assembly jig would be necessary to avoid the possibility of angular misplacement, and ensure that true axial alignment was maintained. The amount of "interference" (that is, the extent to which the shaft or pin should be made larger than the eye in the web into which it is to fit) should be about 0.0015 in. to 0.002 in. for a shaft ½ in. diameter, and the limit of tolerance not more than 0.0005 in. In view of these rather exacting conditions, it is doubtful whether the process is a really suitable one for the amateur constructor, and I have never encountered an example of its successful application for a "full" (double-bearing) crankshaft.

Shrinking

I have, however, built overhung cranks in this way, using a mandrel press and a simple form of jig, but in this case, only axial alignment had to be looked after, and the question of getting two shafts in concentric alignment did not arise. One could, of course, assemble shafts roughly by shrinking, leaving them oversize for correction by machining, but it is difficult to see any practical advantage in this method, except, possibly, economy in material.

The use of dissimilar metals for the shafts and the webs, the latter having the higher co-efficient of expansion, would undoubtedly increase the facility of carrying out the shrinkage process, and one could also use a hard or high-tensile steel for the shafts, in conjunction with a relatively soft or tough steel for the webs. In modern practice, the procedure in shrinking on is often reversed ; that is, instead of heating the web to expand it, the pin or shaft could be cooled to a very low temperature to contract it. There seems to be no reason why the two methods could not be used in combination ; but it is hardly likely that the amateur will have facilities for refrigeration to the temperatures necessary to take full advantage of such a process.

* *Continued from page* 288, "*M.E.*," *March* 21, 1946.

Assembly of crankshaft components by pressing, without the application of heat, cannot strictly be classed as "permanent" fabrication, since it is potentially possible (though it may be difficult) to dismantle and reassemble them again more than once in this way. It may, however, be mentioned that this method has been used in the manufacture of motor cycle, car and stationary engines, and I know of one or two cases where it has been applied successfully to model petrol engines. But it is little, if any, easier than shrinking-on, as the same precautions to ensure alignments would have to be taken, considerably more force would have to be used in assembly, and limits of accuracy of the mating parts would have to be extremely fine, to produce a firm joint without danger of splitting or distorting the crank webs. In some cases, attempts to use press fits, even in so simple a matter as fixing a wheel on a shaft, have proved unreliable, and partial seizure may produce an illusory impression of security.

Brazing and Welding

These methods, especially the former, are very extensively used in small crankshaft construction, and occasionally used in quantity production of model petrol engines. I have produced many crankshafts successfully by brazing, and provided that sound methods are employed, there is little reason to suspect that such shafts are any less satisfactory, from the structural point of view, than those made from whole metal. It is, however, absolutely essential that the brazing should penetrate properly through the joint, and one of the disadvantages of the method is that the external appearance of the finished job does not give any definite indication of its soundness. This is, perhaps, a more important matter in the case of a crankshaft than any other brazed structure—such as, for instance, a boiler—since there is no way, other than a destructive test (which obviously defeats its own purpose!) of proving its ultimate strength, and a crankshaft failure usually results in wrecking the engine.

It is, however, possible to be fairly certain of the soundness of the joint, if reasonable precautions are observed in carrying out the work. The art of brazing has been dealt with by several contributors to THE MODEL ENGINEER, and there is little I need add to their precepts, with the possible exception of reiterating the advice that there are four essentials to successful brazing; (1) cleanliness, (2) adequate but not excessive heat, (3) correct flux, and (4) correct brazing alloys or "spelters." Even the raw novice can master a job of the nature now under discussion, with a little practice, if he will but observe these simple rules.

Perhaps the easiest of all brazing (or strictly speaking, "hard soldering") alloys to use is silver solder, and this will make quite a satisfactory joint for our present purpose. One may use a harder spelter if plenty of heat is available, but it does not follow that the tensile strength of the joint will be any greater. The use of brazing alloys which have a wide plastic range should be avoided, as the important thing is *penetration* of the joint, and for this there is nothing better than silver solder—particularly "Ezy-flo," used in conjunction with "Tenacity" flux, as recommended by the makers.

Scoring

In brazing a shaft into a disc or web, it will be found that longitudinal scoring of the shaft assists penetration, as it is well known that when in a molten state, a free-running spelter will follow a mere scratch by capillary attraction. On the other hand, it does not seem to follow a screw-thread very readily, probably due to the great projected length of the path which it offers, and I know of several cases where the conjunction of screwing and brazing has been unsuccessful. My favourite method of preparing shafts for brazing is to knurl the surface lightly with a fine straight knurling tool at the point where the joint occurs.

Some operators like to drill a hole in the outer member of the joint—in this case the crank web—to enable brazing metal to be fed into the centre of the joint, but I have not found this necessary, and consider that it may involve risk of weakening the structure. Neither have I found it necessary to cross-pin the joint before brazing, unless this is done for location purposes. The pin has very little strength to resist torque, and will certainly not save the situation if the adhesion of the brazed joint is faulty.

The practice of shouldering down the ends of the shafts where they fit the webs is, in my opinion, undesirable, as the reduction in the area of the surface in the joint puts it under increased mechanical stress when load is applied. In my opinion, the diameter of the brazed joint should be, if anything, larger than that of the finished shaft.

Attempts are often made to braze a shaft after the components have been machined to finished size, but though this may save time, it is hardly likely to result in a really high-class job. Quite apart from the difficulty of keeping the spelter away from the bearing surfaces of the shaft and crankpin, the heating is almost certain to produce minor distortion and scaling, also, occasionally, pitting or wasting of the metal, which will impair both the finish and accuracy. It is much better to allow a little material for finishing all over, or at least on the bearing surfaces of journals and pin, though, from the purely utility point of view, there is no need for subsequent machining of the webs.

Assembly for Brazing

Although it is quite practicable to braze the shafts up roughly, with plenty of allowance for machining, and subsequently to mark out in the same way as for a solid shaft, a lot of work is saved, and general quality improved, if the shafts are held in correct alignment for the brazing operation. A method which I have found highly successful is to make both the main journal, or pair of journals, and the crankpin initially to the full overall length of the shaft, preferably from fairly accurate bright drawn rod, and to centre each end as truly as possible. The webs are then assembled in their correct positions, the holes in them having been drilled exactly the same distance apart, either by

clamping together and drilling at one shot, or by setting them eccentrically on the lathe faceplate, and locating off a previously drilled centre hole. If the holes are made a push fit on the shaft, and the latter then knurled as suggested at the joint seatings, the webs will fit quite tightly enough to ensure that they will not shift during the brazing operation.

A further security against any possible upsetting of the alignment of the shafts in either plane, consists of the clamping of alignment plates across the extreme ends of the shafts, as shown in Fig. 12. It will be seen that one plate in each case is flat, the other having two vee notches, which locate the shafts firmly at their correct centre distance. A good way to form these notched plates is to clamp the two of them together and drill exactly on the joint line, the holes being jigged or otherwise located from the holes in the crank-webs, so that they are bound to be the right distance apart. If the holes are drilled undersize, they may be opened out by filing or machining to form vee notches in the individual plates, or they may be made the same diameter as the shafts, and left as drilled.

The plain flat plates should be quite straight, and extended some distance either side of the shafts—the longer the better, within reason—so that they may be "sighted" for alignment like the joiner's "winding strips." It makes no difference if the journals and crankpin are of different diameters, so long as each is parallel, or has its extended ends turned to an even size. A still more positive alignment jig could be made by joining the two alignment strips at the ends to form a rigid rectangular frame, but this involves a lot more work, and the method shown has proved quite satisfactory.

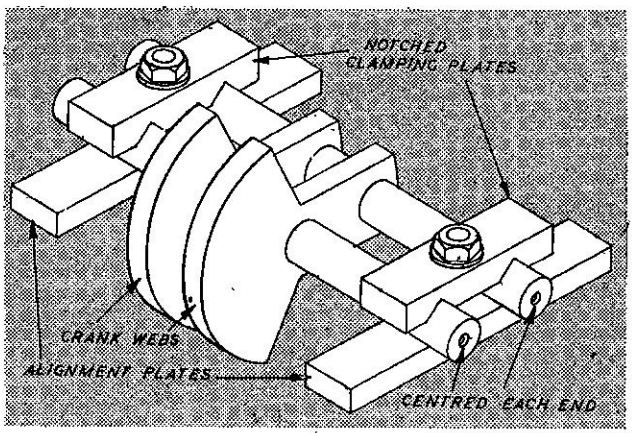


Fig. 12. Crankshaft assembly with alignment plates clamped on in preparation for brazing

When the plates are clamped in position, they are sighted for alignment, and any twist corrected before brazing. The squareness of the webs should also be checked up, the simplest method being to put the whole assembly between the lathe centres, on the journal axis, and see that the webs are free from side wobble. A slight countersink at the outer edge of each of the holes will help to lead the spelter into the joint, especially if the brazing is carried out with the shaft propped up vertically, or nearly so. If the spelter can be obtained in the form of wire or thin strip, a short piece may be cut off and bent into a ring, which is placed around each shaft, so that it will run into the joint as soon as it reaches fusion point; it may be found desirable to break up the surface tension of the metal by scratching it with the end of a pointed wire or broken hacksaw blade, to start it flowing. Both the joint and the ring of spelter should be kept well covered with flux during the operation, so that the formation of oxide is avoided.

This procedure will generally be found better than applying the spelter in the form of rod or strip after the work is heated, as the beginner often finds it difficult to control the position or quantity of the molten spelter, and may find that it flows anywhere except where required.

Flames

I have found it best to use a fairly diffused flame for work of this nature, such as obtained from a blow-lamp, or an atmospheric or low-pressure gas blow-pipe, as this heats the work over a fairly wide area, and avoids distorting stresses which might be produced by intense local heating of the joint while other parts remain relatively cool. If the vertical position is adopted, the shaft and crankpin joints at one end can be brazed first, and the work then reversed to deal with the other side; but all joint surfaces should be well fluxed before heating, or oxidation may take place at one set of joints while the others are being brazed. Make certain that the spelter has penetrated through each joint, by looking for the "witness" ring around the inner sides, which should not receive any special treatment unless it is found that there is reason to doubt that penetration is complete. Sometimes surface tension will prevent the spelter flowing through, in which case a scratch with a fluxed wire around the inside of the joint will usually remedy matters.

Immediately after brazing, and while the work is hot, take a sight along the clamping strips, and if any twist is apparent, correct it by holding one end in the vice and "setting" the other with a pair of tongs or a wrench. Allow the work to cool naturally down to well below a black heat, after which, a quench in water will help to loosen scale. It is not generally considered desirable to dip out in "pickle" when the work is of ferrous metal, but the discreet use of a weak acid dip is permissible, if scrupulous care is taken to remove all traces of it afterwards.

To finish the brazed shaft, it is dealt with in much the same way as a forged crankshaft. First cut away the portion of the main shaft between the crank-webs, and swing the work on the crankpin centres for finishing the pin, also skimming the sides of the webs if necessary. Next cut away the end extensions of the crankpin, fit a stretcher piece between the webs, and swing on main centres to finish the journal surfaces, and outside faces of webs.

Furnace Brazing

Although the process is hardly likely to be available to the amateur, mention may be made of the modern method of brazing components in an enclosed furnace, usually in a controlled atmosphere of inert gas, which prevents oxidation, so that little or no fluxing of the joint is necessary. It is usual to apply the spelter to the work in the form of a paste or "paint" before passing through the furnace, and the work comes out quite bright, without even "blueing up," so that, with this method, it would be quite possible to dispense with the need for subsequent machining of crankshafts.

Perhaps the most serious limitation in the fabrication of crankshafts by brazing is the impracticability of hardening them, or using high-tensile steels. Not only are the latter sometimes difficult to braze without special fluxes, but the heating may destroy their special properties, and render them either too soft or too brittle. Quenching out in oil or water after brazing has been attempted, but the results are likely to be somewhat dubious, to say the least. The best way to obtain a hardened surface on a brazed shaft would be by some process which does not involve further heating, such as electro-deposition of a layer of hard chromium.

Welded Crankshafts

I have encountered a good many examples of welded crankshafts, but most of them have either been found unsatisfactory from the start, or have ultimately given trouble in service. Examination of shafts which have failed has generally disclosed incomplete penetration of the weld, inclusion of slag, or crystallisation of the metal. The first two faults may be due to lack of skill in welding, but the latter seems more or less inevitable where temperatures approaching the melting point of the steel are employed, though careful normalising after welding may effect a partial remedy. One is, however, forced to the conclusion that there are many pitfalls in the application of welding in this particular case, and if attempted at all, it should only be carried out by someone with a good deal of specialised knowledge and experience in this modern art.

In the instances referred to, the method of welding used was by means of the oxy-acetylene blow-pipe, no examples of crankshafts welded by other methods having been encountered. It would appear, however, that there are possibilities in the manufacture of crankshafts by electric resistance welding. This process, if properly applied, ensures the complete penetration over the full area of the weld, and enables dissimilar metals, which may possibly be unsuitable for welding by other methods, to be fused together, without overheating sufficiently to destroy their inherent properties in the vicinity of the weld. For instance, an aircraft engine valve may be formed by welding a heat-resisting head to a wear-resisting stem; and it should thus be possible to weld a high tensile shaft and crankpin to mild steel webs.

But here again, the process is hardly likely to be available to the average amateur, and it is mentioned here only to indicate possible future developments in the manufacture of engine components. So far as I know, nobody has yet attempted to produce crankshafts for commercial engines by electric welding, and whether it would in any circumstances ever be found profitable or otherwise beneficial to do so, depends upon circumstances which are beyond the scope of this discussion. Brazed crankshafts and other components, however, are very commonly used in commercially-produced miniature engines.

Rust Joints

To cover the field of permanent fabrication completely, mention may be made of a method which is but little known nowadays, and which few modern engineers would believe in, but which, according to credible information, has been used quite successfully in the manufacture of crankshafts.

It is well known that the normal oxidation of iron or steel, which takes place when exposed to damp, can be speeded up by chemical means, such as the application of acids. In the past, iron pipe joints have often been made by applying a solution of sal-ammoniac, or muriate of ammonia, sometimes in conjunction with other chemicals, or mixed with iron filings. The resultant chemical action involves some expansion of the surface layers of oxide, or "growing," with the result that not only are interstices in the joint effectively filled up, but parts assembled to a moderate fit become immovably fixed.

I have been informed that the crankshafts of a certain well-known make of motor cycle, which bears a very high reputation, were for many years fabricated by this method, and proved entirely satisfactory. I have not tried out such a method myself, and put forward the idea with all reserve, but if there is any reader who has tried it, or is in a position to offer any further information about it, I should be glad to hear from him.

(To be continued)

MODEL SHIPS' RIGGING

We have received from Mr. J. Partridge, 39, Swan Street, Attercliffe, Sheffield, some samples of model ropes suitable for use as rigging for model ships. The ropes are woven out of small-gauge phosphor-bronze wire, the number of strands being varied according to the required diameter of the finished rope. The samples we have received are, respectively, 3-wire, 5-wire and 6-wire; they are tough but extremely flexible, and are easily held dead straight when in tension. We think that builders of model ships will find these ropes useful.

"HIELAN' LASSIE"

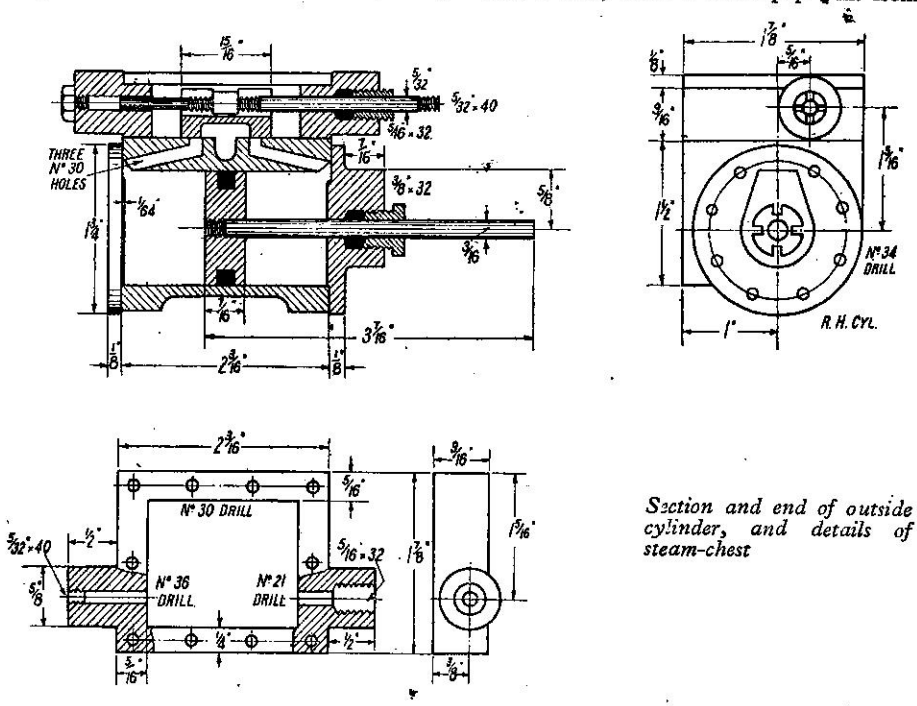
By "L.B.S.C."

WHILST some of the good folk who are building the "Lassie" have their lathe and half the workshop floor covered with gunmetal or bronze chippings, it might be as well to tackle the machining of the outside cylinders; then those whom the cap fits can have a good sweep up, and not tread the said chippings all over the house. There is not much actual difference in the machining and fitting of the outside cylinders, compared with the inside ditto; they are same bore and stroke, have the same ports and passage-ways, valves, and covers. The difference lies in the external shape, the attachment, and the exhaust way. If I run briefly through the operations, and indicate where the differences are, builders ought to be able to manage the job by aid of the detailed instructions already given.

Check off the core-hole as previously mentioned; and if out of position, clean one end of the casting, and strike out the circle showing true bore, from a wood plug in the core-hole. Then clean up the port-face, should it be "knobbly" or uneven, and bolt the cylinder, port-face down, to an angleplate exactly as described for the inside cylinder, setting it true by applying a try-square to it, stock to face-plate, and blade to bolting-face of cylinder. Then go ahead, and face the end, bore, and ream exactly the same as you did the inside cylinder. Face the other end with the casting on a stub mandrel; clean up the port-face, and machine off the bolting-face, with the cylinder up-ended on the angle-plate. The distance from edge of bore to port-face, should be the same as for the inside cylinder, viz., 11/32 in.; and the distance from the edge of bore to the bolting-face, should be 13/32 in. The bolting-face should be approximately 1½ in. from top to bottom.

Note Different Exhaust Way

The ports are cut exactly the same as on the inside cylinder, and the passage-ways drilled from the ends of the bore, to the steam ports, just as described; but the exhaust outlet is drilled in a different manner, as the exhaust comes out through the front of the cylinder, instead of on the top. Make a centre-pop on the bolting-face, $\frac{5}{16}$ in. below the port-face, on the vertical centre-line of the casting, and drill a ¼-in. hole slanting upwards into the exhaust-port; see sectional illustration. Next, on what will be the front end of the cylinder (the end which has the plain cover, beginners should note) make a centre-pop ¼ in. from the bolting-face and ¼ in. below the port-face. From this point, drill a ¼-in. hole lengthwise down the cylinder until it breaks into the diagonal hole leading to the exhaust-port, as shown in the broken-away portion of the bolting-face of the cylinder. This job should be done on a drilling-machine; or, if not available, in the lathe, with the drill in the three-jaw and the



Section and end of outside cylinder, and details of steam-chest

casting held against a drilling-pad in the tail-stock. If the drill doesn't go in truly, it may distort the bore, break through into the port-face, or emulate our late enemies by poking its nose into some other place where it hasn't any business and can do a lot of damage. Counter-bore the end of the hole with a 9/32-in. drill, and tap $\frac{5}{16}$ in. by 40—a fine thread is desirable where pipes have to be screwed in—then drill and tap the end of the diagonal hole 9/32 in. by 40, and screw in a brass plug, filing off flush with the bolting-face. If you have no tap that size, drive in a small plain brass plug, but be careful you don't obstruct the longitudinal hole. The plug can't come out when the cylinder is screwed to the frames.

The Rest is "Ditto Repeato"

The instructions already given for the inside cylinder covers, piston and rod, steam-chest, slide-valve, and spindle, apply equally to the outside cylinders, so there is no sense in wasting space by going over the whole rigmarole again. Don't forget that the registers on the covers only want to enter the bores a matter of 1/64 in., because there won't be sufficient clearance for a $\frac{7}{16}$-in. piston if they are made any wider. When fitting the front covers, it will be noticed that they overlap the exhaust holes; so, after drilling and tapping all the screw-holes in the flanges, put on the covers temporarily, holding by two screws, and mark on them the part that covers the exhaust hole. Remove covers, and carefully file away the marked part, so that you can screw a $\frac{5}{16}$-in. pipe into the exhaust-hole with the covers in place.

The only difference in the steam chests, is that they are a little narrower than the inside one, measuring $1\frac{7}{8}$ in. across instead of 2 in.; the machining and fitting are carried out just the same, also the fitting of the gland and cover-plate. No entrance for steam is drilled; this will be done later on, when we know exactly where the pipes are going. You can, however, if you so desire, drill a $\frac{1}{8}$-in. hole near the outer front corner, and tap it 5/32 in. by 40, making a little hexagon-headed plug to fit. This is handy for giving a "dope" of thin oil when the engine has been standing a long time without steaming it, and the heavy-grade superheater-oil used when running, has settled into the consistency of molasses, and "gummed her up." She will need the same grade of cylinder-oil as a full-sized locomotive with a high degree of superheat; steam temperature is constant, another example of the fact that Nature won't be "scaled." The slide-valves, spindles, nuts and glands are exactly as described for the inside cylinder, so just refer back to the last two instalments if your recollection is at fault, and that is all there is to it.

How To Erect the Cylinders

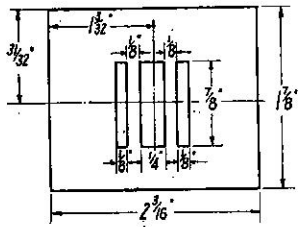
To help in the erection of the cylinders, you will need a $\frac{5}{16}$-in. drill that will project $3\frac{1}{2}$ in. or so beyond the chuck of a hand-brace. This can be made by brazing a piece of $\frac{5}{16}$-in. steel-rod to the end of an ordinary drill; or alternatively you can make a one-piece substitute from a 4-in. length of $\frac{5}{16}$-in. silver-steel. First, file or grind one end flat, like a screw-driver; then file or grind the flat part to an arrow point, backing off the two edges and thinning the top like a drill. Harden and temper this to dark yellow, and give the cutting edges a rub-up on an oilstone. It does not matter about backing off the stem, or any part of it, below the arrow-point, as the gadget is only used for making countersinks.

The correct location of the outside cylinders, is with the top front edge of the steam-chest $7\frac{11}{16}$ in. from the front edge of frames, (that is, behind the buffer beam) and $\frac{1}{16}$ in. below the top of frame. Put the cylinder in this position, and hold it temporarily in place with a big toolmaker's cramp over frame and cylinder. Now put the extension piston-rod, previously mentioned, in place, and adjust cylinder until the extension-rod passes across the centre of the middle coupled axle, the cylinder itself conforming to the correct position given above; then tighten the cramp. Put the extended drill or countersinking gadget, in your hand-brace, poke it through the screw-holes in *both* frames, and make countersinks on the bolting face of the cylinder. Remove the latter, drill out the countersinks with 5/32-in. drill, and tap them $\frac{5}{16}$ in. by 40. One of the drilled holes will pierce the exhaust way, but that doesn't matter a Continental; the only precaution to observe is that the screw in that particular hole mustn't enter far enough to block up the "entrance to the way out" for the exhaust steam. Give the other cylinder a dose of the same medicine, then attach each temporarily by a couple of screws; they will all be safe then, whilst the motion parts are being made. I know somebody who made two lovely cylinders, left them on the bench, accidentally knocked them on the floor, and had to make new piston- and valve-rods.

Hexagon-headed screws of $\frac{5}{16}$ in. by 40 pitch are not commercial articles, so you will have to make your own, but they are only a few minute's work. Chuck a piece of $\frac{5}{16}$-in. hexagon steel in the three-jaw—that *is* a regular commercial size—face the end, turn down $\frac{3}{8}$ in. length to $\frac{5}{16}$ in. diameter, and screw $\frac{5}{16}$ in. by 40. Part-off to leave a head $\frac{1}{8}$ in. in thickness, reverse in chuck and chamfer the corners. Screw-making is a terribly hard job, isn't it? I'd rather make every screw used in every one of my engines, than pay the outrageous prices demanded by certain "model" suppliers! Thank goodness there are still a few honest folk about, who believe in giving locomotive-builders a square deal, instead of making them "pay through the nose" for their fascinating hobby. The other people evidently haven't realised yet that there is a peace on, and there is such a thing as healthy competition. 'Nuff said! Before going into the motion details, I will give the needful information about piston-valve cylinders for those who wish to fit same; but I can't do it this week, because the drawings accompanying this week's notes, reproduced here, are just about as much as I can manage at one "session." I'm afraid your humble servant was never intended for mechanical draughtsmanship, as I have to stop and "get up some more steam" after every spell of drawing. Honestly, I'd far rather make the cylinders themselves, than drawings for them!

Conjugated Valve Gears

Here is an interesting item of news for all followers of these notes who are interested in conjugated valve-gears, or "derived" valve-gears, as some folk call them. Mr. H. Holcroft, who recently retired from a high position in the chief mechanical engineer's department of the Southern Railway, has written a series of articles on these gears for *The Engineer*, beginning in the issue for February 15th last. There is no other person in this wide world who knows more about conjugated valve-gears than Mr. Holcroft. Although the well-known "two-to-one" is usually known as the Gresley gear, owing to its use by the late Sir. H. N. Gresley on his three-cylinder locomotives, the gear is really Mr. Holcroft's, as he originated the idea a long time before it was ever put into practice. It would be an honour indeed for "Lassie" builders if he designed a simple arrangement to use as an alternative for the inside valve-gear, applicable to the layout of the cylinders. From my experience of the Holcroft gear on "Tugboat Annie," I'll say without fear of contradiction from any unprejudiced person, that it would be a perfect success right away.

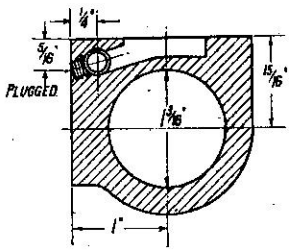


Port-face of outside cylinder

Cylinder Drain Cocks

Some of the followers of these notes have been asking why it is that I never specify cylinder drain-cocks for 2½-in. gauge engines, and only in special cases for 3½-in. gaugers, such as the solitary cock on the steam-chest of "Petrolea." Well, I don't believe in unnecessary complications, for one thing; and in tiny locomotives, we don't get such excessive condensation when starting from all cold, as obtains in full-size practice. On my own 2½-in. gauge engines, the few drops of condensate water created by a cold start, are thrown out of the chimney without affecting valves, pistons, or lubrication; and that is the only water ejected during the whole of a long run. I believe in really hot steam, and practise what I preach; so that the cylinders, after a minute or so, become too hot for any condensation to take place. Thus there is no need for any means of relieving the cylinders of water. Should a boiler inadvertently be allowed to become too full, and priming occurs, the valves of a slide-valve locomotive will lift off the faces and let out any water trapped between piston and cylinder covers; so there is no fear of knocking out a cover or fracturing a piston or rod.

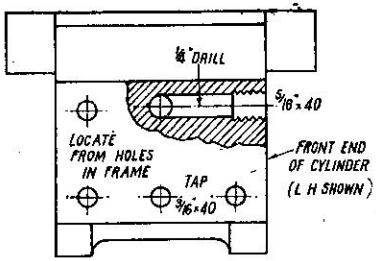
Pretty much the same state of affairs, occurs with a 3½-in. gauge engine having separate cylinders; the cylinder walls are no thicker than those of a 2½-in. gauge job, and I find they heat up just as speedily. However, in the case of "Petrolea," there is a big block of metal to warm up, and it would naturally condense more steam in the operation; and as the steam-chest is underneath, and big sister had a couple of drain cocks in her steam-chest cover, it was a simple matter to fit a drain cock, and let the condensate water out through it instead of *via*



Cross-section through exhaust-port

the chimney. Incidentally, it gained the approval of our old, respected, but somewhat troublesome friend, Inspector Meticulous. Most of the Stroudley engines only had steam-chest drain cocks; they were at the front on the "Gladstones," and at the back on the "Terriers."

Conditions are different with piston-valve cylinders, as some of the "boys of the old brigade" found in full-size practice when they first tried piston valves. Bouch, on the Stockton and Darlington, and W. G. Beattie on the L.S.W.R., had trouble with water trapped in the steam-chests, resulting in smashed bobbins, and bent and broken valve-spindles. We wouldn't get that trouble in the small size; but water trapped between covers and piston couldn't get out by lifting the valve, as with a slide-valve engine, so "the clock would stop altogether," in a manner of speaking, if no exit is provided. Either cylinder drain cocks or spring-loaded relief valves will do the trick;



How to drill the exhaust way

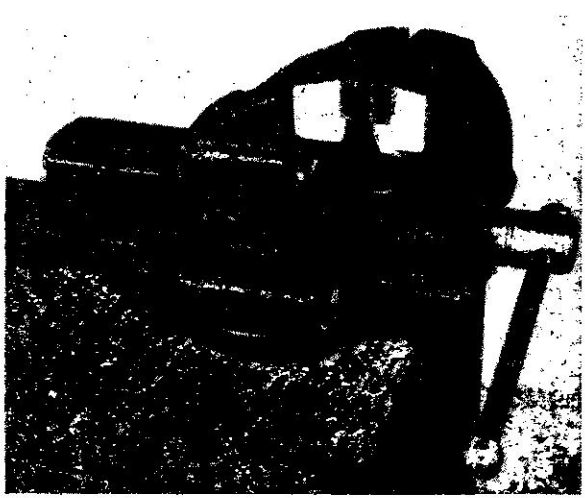
I have used both. The spring reliefs are simply weeny safety-valves screwed into a tapped hole in the flange at each end of the cylinder, and set to blow at a few pounds above boiler pressure. In fact, they may be set for the same pressure as those on the boiler, as there is always a slight drop between boiler and cylinders. Any water trapped between piston and cover, easily lifts the valve and escapes. The valves also operate automatically if the boiler should prime whilst the engine is running.

I described a simple type of cone-valve operated by a sliding cam, for the cylinder drain cocks of "Maisie"; they also acted as snifting-valves. Ordinary plug-cocks may be used, as they don't stand much chance of sticking, owing to the lubrication they get from the cylinder oil; also, a slight blow is of no consequence. Most plug-cocks either stick or leak! The good folk who intend using piston-valve cylinders on the "Lassie," had better use the same type of cylinder-cock that I have fitted to "Jeanie Deans." The personal appearance of these cocks, is very similar to the one specified for "Petrolea," but I turned the bodies from $\frac{5}{16}$-in. brass rod. They are a bare $\frac{1}{2}$-in. long overall, with $\frac{1}{8}$-in. of 5/32-in. by 40 thread on one end, the other being turned to a straight nose. They are drilled No. 55. The cross-holes for the plugs were drilled with the same number drill, and reamed taper with the reamer which I made for injector combining-cones. To turn the plugs to correct taper, the top slide of my Boley lathe was set over $4\frac{1}{2}$ deg. The bit of plug projecting through the cock body was turned down to $\frac{1}{16}$ in. diameter and screwed an American pitch, 0-72, which is much finer than 10-B.A. I have taps and dies for the small American machine threads. There is a small squared portion between the taper and the thread, and the plugs are kept in place by the usual square-holed washer and nut. They were ground in with pumice powder and water, and do not leak.

The large ends of the plugs are cut off $\frac{1}{8}$ in. from the cock body; two of them are cross-slotted, and two have squares, on which are mounted weeny steel handles $\frac{3}{8}$ in. long. To hold the plugs for slotting and squaring, I drilled a piece of $\frac{1}{4}$-in. brass-rod, No. 50, holding it in three-jaw, and then reamed it with the same reamer used for the cross-holes. The taper plug jammed tightly enough in the taper hole, to allow the end to be slotted of squared, and no chance of damaging the plug. The two "handled" cocks were screwed into the flanges of the big L.P. cylinder, and connected by a "0000-gauge coupling-rod." The two slotted cocks were screwed into the steam-chest covers of the upside-down H.P. cylinders, with the slotted plugs in line, and towards the centre of the engine. A $\frac{1}{8}$-in. shaft, with flattened ends engaging the slots, runs right across the engine, being carried in two brackets; it has a small drop lever on it, with a long rod connecting same to a hand-lever at the footplate end. A steel sleeve, $\frac{3}{4}$ in. long, is fitted near one end of the cross-shaft, and carries two little parallel levers, one at either end. One is connected to the nearest L.P. cock by another weeny coupling-rod, and the other connected to a second hand-lever at the footplate end, working on the same fulcrum-pin as the lever already mentioned. By operating both levers together, the cocks can be opened and closed simultaneously, or either pair can be worked independently; the levers are of different lengths, the shorter one having a small handle or glorified knob at the side, making it easy to pull. The same arrangement would do admirably for a "Lassie" with piston-valve cylinders; and as soon as I can get a photograph of the arrangement, I will, all being well, show it in these notes.

A New Parallel Bench Vice

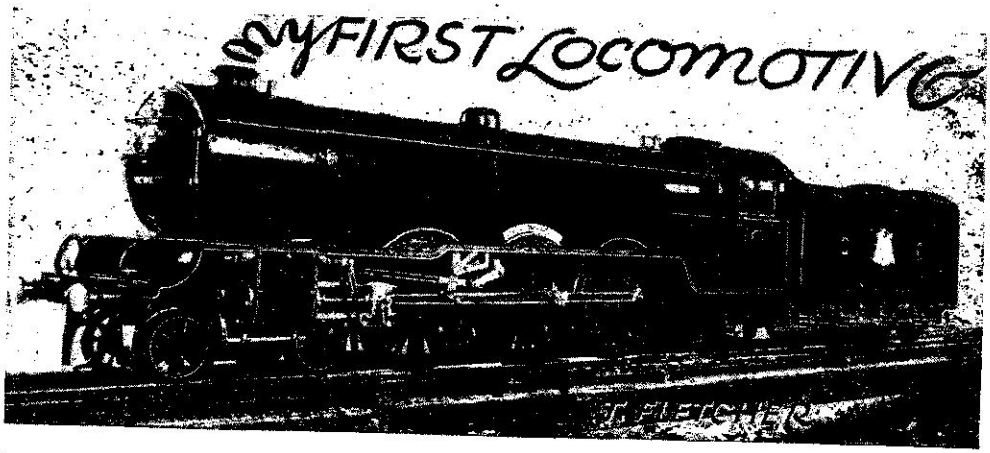
Messrs. T. Garner and Son Ltd., 5, Sheffield Road, Barnsley, have recently submitted for our inspection a sample of the No. 1 "Hi-Duty" bench vice, as recommended by them as specially suitable for model engineering requirements. It is a very sturdily-built tool, embodying several novel and commendable features of construction, including machined slideways in the body and on the sliding member, the upper thrust surfaces being angular, so that alignment is maintained under heavy working conditions.



The base flange is designed in such a way that it provides complete stability when fitted to the bench with the jaws overhanging the front edge, and two holes are provided, to take $\frac{3}{8}$-in. fixing bolts. Hardened steel jaws are fitted, and the operating screw is of substantial proportions, with square thread, and spring compensation for backlash. The sample submitted has jaws 3 in. wide, and opens to 3 in. between jaws, while maintaining full bearing in the slideways and lead-screw nut; weight is approximately 14 lbs. This size of vice should be quite suitable for the general run of model work, and is much handier for dealing with small or delicate components than the usual heavy jobbing bench vice.

Messrs. Garner have also brought to our notice the current issue of "Tool News," which contains many items of interest to model engineers, also their Business Reply Folder, which enables customers in Great Britain and Northern Ireland to submit orders post free.

MY FIRST LOCOMOTIVE



TO begin with, the engine is *not* a prototype for which much can be said, but, personally, I derive so much pleasure from designing for myself, that apart from ideas taken from a number of engines, I can only describe it as a free-lance Pacific. Also, I am not really a locomotive enthusiast—my real interest is in ships. At the same time, I have endeavoured, in building this engine, to put into it the best craftsmanship I was capable of, having regard more for the joy of good workmanship than the actual model, which, to my mind, is of secondary consideration. I have the satisfaction, after putting the engine through complete tests, that it is all I hoped for it—a good steamer and an efficient engine for its size.

I have in mind to experiment with oil fuel and have fitted an air compressor on one of the frame stretchers; of the semi-automatic valve type driven by a large throw ($\frac{7}{16}$ in.) eccentric which also drives the mechanical lubricator, the latter being of the oscillating type and fitted, as I always do for liquid fuel and oil, with an oil filter housed in the check-valve chamber. This, I believe to be essential to exclude unavoidable grit in the oil-box housed between the frames under the smoke-box, if one is to prolong the life of cylinders and pistons and obviate frequent reboring.

The main axles are of silver-steel turned on centres, the wheels being pressed on and keyed, and the main bearings are in mild-steel, split and bronze lined and bolted together by two long screwed bolts which also serve to carry the double helical suspension springs (taken from the syncromesh clutches of a Hillman 10. These are just right in every way for the job—length, diameter and tension). Lubrication for these bearings is by force feed from a plunger pump and tank on the cab side and distributed by a bifurcated pipe line with branch pipes dipping one into each horn block and just clear of the main journals. A little adjustment gave very satisfactory service with this system and obviates the use of an oil-can in awkward and inaccessible places.

Water feed is from two diametrically opposed ram pumps $\frac{1}{2}$-in. diameter and $\frac{3}{8}$-in. stroke, regulated by by-pass directly into the suction-pipe from the tender; the latter pipe also connects to the emergency hand pumps, housed in the tender. Contrary to opinion, this system works well and does away with the need of a separate by-pass pipe and connection to the tender.

The leading bogie is of the L.M.S. type—cantilever suspension on two pivoted semi-elliptical leaf-springs. These springs, as are all the springs on the engine and tender excepting the main suspension which are helical, may be of interest to our readers. They are constructed from 12/1000-in. pen steel, cut into 7/32-in. strips, with eyes silver-soldered on to take the drop-links. In the case of the tender, alternate layers of this and 22-gauge annealed copper were used to give form without too great rigidity. I can confidently recommend these springs both from the appearance and function points of view. They answer well to rail inequalities and do not cause derailments. The leading bogie bearings are split for easy take-up and renewal without damage to the wheels and axles. The trailing wheels are borne on radial or, to be quite correct, tangential axle-boxes as in practice on L.N.E.R. Pacifics. This gives the advantage of greater space below the firebox and so allows ease in fitting the ashpan and a deeper firebox. In this engine the fire-bars are cast in two longitudinal halves supported on lugs attached to the firebox. They are easily removed when the ashpan bottom is slid out. The ashpan is a deep sloping one, brazed together and slipped into the rear framework on which it rests, before mounting the boiler and completely protecting the trailing wheels from grit. The bottom fits into slides and is conveniently removed from the right hand side of the engine, so obviating the uncoupling of the tender while working.

The cylinders are a little unusual, being made of cast iron and lined with monol metal sleeves ground and lapped true. Pistons are of duralumin with two cast-iron rings.

Only the barest amount of lead has been allowed for in my valve design because in my opinion in a small engine the time-lag is so little; and also in my engine the necessary cushioning of reciprocating parts is reduced by employing duralumin connecting- and coupling-rods. To my knowledge this is the

first time this metal has been used for this purpose on a model railway engine and, in every way, I can confidently recommend it. All rods, levers, etc., in the motion have been fluted.

When tested, the engine answered well to its expansion-gear in both directions, despite the unavoidable aberrations which its geometry produces. Lubrication is by ordinary ratchet and pawl feed from a small oscillating pump and the oil is filtered through a small fine wire gauge filter in a special housing carrying this and also the second check-valve.

The valve-link is one of the types employed in L.N.E.R. practice, *viz.*, a central link, two covers carrying the trunnions and separated by distance-pieces to allow articulation of the radius rod.

Drainage for the cylinders is by spring-loaded poppet valves operated by rods with inclined plane slots, in turn operated by external and internal drop-arms swivelling in bushes attached to the frames, the internal arms being attached to spring-loaded rods fixed to a yoke. The valves close by their own spring pressure and are opened by a drain-cock lever in the cab, which transmits the movement to the operating yoke by means of a Bowden wire and tube.

The reversing gear is of othodox pattern and not screw driven which is slow and tedious in operation. So much for the engine proper.

Boiler

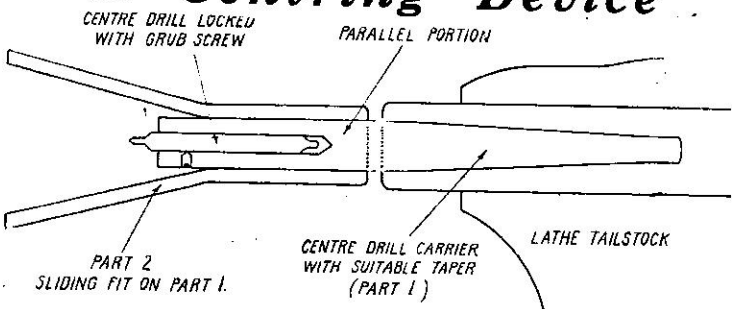
The boiler is for the most part orthodox and has twenty-one ⅜-in. tubes and one ¼-in. superheater tube. The firebox is partly copper-clad to cover firebox stays and to provide fixtures for the handrail knobs, which, incidentally, I turned with a former tool, jig-bored them and turned down the stems in a special collet-chuck to ensure perfect uniformity. The fire-door is secured by studs let into three of the back stays; the advantage is, I think, obvious. All boiler end fittings are flanged and studded and nutted rather than screwed in, in which case the threads in time become stripped and, also, it is hard to get the water-glass lined up properly and steam tight. The water-gauge fittings have also screw down valves in case of glass breakage, which can thus be removed and replaced under pressure.

The only other point of interest in the boiler is the smokebox. Experience taught me how difficult it is to assemble steam pipes, etc., inside the smokebox, and to obviate this I have made mine in two sections—a lower segment on which the boiler rests and an upper extending about three-quarters round the smokebox which can be withdrawn with the petticoat pipe and chimney and is fixed in position by screwing to the lower segment. It makes assembly of the steam unions easy. The safety-valves are of the "pop" type—two in number.

Tender

The tender is copied from the L.N.E.R. corridor type and apart from the springs has nothing of special note. It is fitted with a drain-valve to empty the tank and overflow-pipes in case of over-filling. The springs may be of interest. They are real leaf springs and have no helical springs embodied in the spring buckles. They are made from 12/1000-in. pen steel cut into 7/32-in. strips and annealed copper in alternate layers—thus giving something like scale depth with easy resiliency. I assure you they work well and have caused no derailments, etc. The tender carries the letters "C.R." (Caledonian Railway) and that company's lovely coat-of-arms. The latter were painted by hand on fine thin paper, gummed on and varnished over. The colour scheme is also that of the Caledonian Railway which I knew so well as a boy and of whose handsome and beautifully-liveried engines I have so many pleasant recollections. In honour of that company and my own native country I named the engine Caledonia, and this appears on plates above the centre wheel splashers.

A Centring Device


CENTRE DRILL LOCKED WITH GRUB SCREW
PARALLEL PORTION
PART 2 SLIDING FIT ON PART 1.
CENTRE DRILL CARRIER WITH SUITABLE TAPER (PART 1)
LATHE TAILSTOCK

Sectional diagram of the centring device

This device has proved very useful when it is necessary accurately to centre bars of a diameter that will not enter the headstock spindle of the lathe.

The sketch is self explanatory and the details are readily made in the home workshop. In operation, the bell portion (Part 2) is held by hand over the work; the centre drill is then fed in the usual way. It is an advantage to have several sizes of (Part 2).—A. E. JERROMES.

A Screw-Centre for Wood-Turning

By W. J. HUGHES

Useful for pattern-making, and for turning wooden wheels, bowls, egg-cups, napkin-rings and similar articles

MOST model engineers will be familiar with the possibilities of the screw-centre, but its use does not seem to be as wide as it might be. This may be due to the fact that even in normal times it was, perhaps, more expensive to buy than was warranted by its somewhat infrequent use. In addition, the commercial article usually has only a small faceplate, which does not afford adequate support and/or friction-grip to the base of the article being turned.

The fitment here described, of which Fig. 1 shows a cross-section, can have as large a faceplate as the lathe will take, and, indeed, wooden bowls 8 in. in diameter have been turned using one. For making wooden wheels for toys its use is excellent, and dozens of sets of these, varying in diameter from 1 in. to 7 in., have been turned by boys in the handicraft centre.

In addition, it has the virtue that it is easily and quickly made, and when made can be set up for use by screwing in three wood-screws—a matter of a minute or two.

Method of Making

A 2-in. length of 1½-in. by ⅛-in. mild-steel was squared up, and centres marked as indicated in Fig. 2. The centre-hole was drilled 13/64 in. to clear a 1½ in. by No. 10 screw, and the others 9/64 in. to clear ¾ in. by No. 6 screws, all holes being countersunk on one side. The 1½ in. by No. 10 screw was now brazed in the centre-hole care being taken that it was square with the plate.

The ordinary cast-iron faceplate was next drilled with three equidistant holes on a pitch circle of 5 in., and these were countersunk on the back. Three 1 in. by No. 8 screws were used to fasten it to the wooden faceplate, which was a piece of ⅝-in. by 6-in. beech sawn to a rough circle. (If desired, 4 screws could be used, but are not really necessary.) The reason why special holes were drilled instead of using the existing slots and holes was to ensure that the wooden faceplate could be replaced in the identical position every time it was used. At a later stage, and further to assist this purpose, the holes in the cast-iron faceplate were marked 1, 2 and 3, and those in the wooden faceplate were marked to correspond.

The mounted piece of wood was next put on the lathe, turned on its outside edge, and faced up. It was then centred and drilled right through, using a 13/64 in. drill in tailstock chuck. The wood-screws were unscrewed, and the wooden faceplate dismounted (which was the stage at which the screw-holes were numbered, as aforementioned).

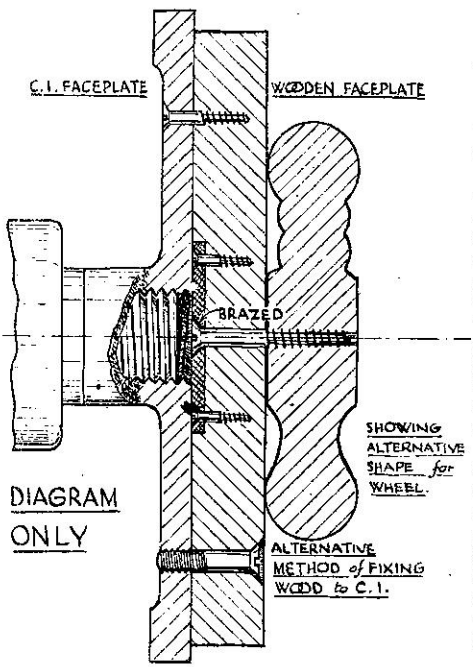


Fig. 1

With the screw of the screw-plate inserted through the hole (of the wooden plate) from the back, the screw-plate was pressed up to the wood, a line was scribed round it, and a recess chopped out with wood-chisels to a depth of ⅛ in., so that when the screw was re-inserted in the central hole, the surfaces of screw-plate and wood were flush with each other. Four ¾ in. by No. 6 screws now secured the two together, and the wooden plate was remounted on the cast-iron faceplate.

When this was screwed on the mandrel-nose, it was found that the thread of the 1½ in. screw, which protruded about 11/16 in. from the wooden faceplate, revolved perfectly true, which, of course, was just as it should be.

Method of Using

Let us assume that a wooden wheel is to be turned; the *modus operandi* is as follows. Set out a circle of the required diameter on the wood from which the wheel is to be turned, and through the centre drill a hole equal in diameter to the core of the centre-screw. (For a No. 10 screw a suitable size will be ⅛ in.) Saw and/or pare the wood roughly to shape, and screw it on the centre-screw. Turn to diameter, but not to touch the faceplate (see Fig. 3a). Then turn outside face to

shape (three suitable shapes are shown in Figs. 1 and 3), and glasspaper well. Unscrew the blank, reverse it, and re-screw it on to the centre-screw, so that the turned face is in contact with the wooden faceplate. Now turn and glasspaper the new outside face, finishing the edge at the same time.

When the wheel is finished it may be removed from the screw, and the centre hole carefully re-

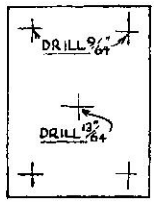


Fig. 2

drilled to the appropriate size for the axle. Where the wheels will have to bear a fair weight (say on an engine or a wagon on which a child may ride), I would advise the fitting of brass bushes, with the use of steel axles. One sees too many of this type of toy where unbushed wheels run on screws driven into the wooden axles, with the inevitable result that the wheels wobble on badly worn holes, while the screws are badly bent (if they don't drop out!).

And here may I emphasise a point which is often neglected—namely, that it is useless to expect wood-screws to hold *adequately* when driven into the *end-grain* of wood. The fibres of

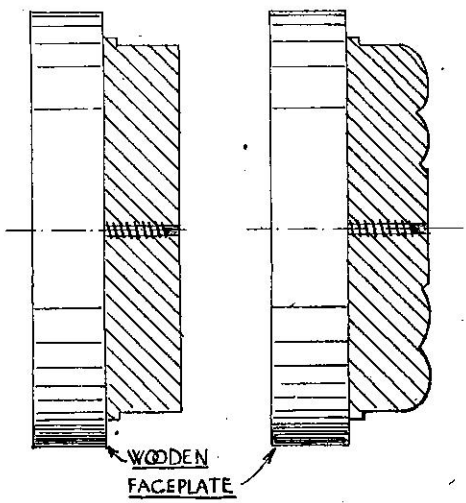


Fig. 3

the wood run the wrong way to grip the threads, and while the screws will stop in, they will not take the strain that they should do. Fig. 4 (*a* and *b*), shows two ways of overcoming this trouble, however.

In the method shown in Fig. 4 (*a*), a rawlplug of appropriate size is *glued* in a hole drilled into the end grain, the screw not being inserted until the glue is dry.

At Fig. 4 (*b*), the method sketched is to glue a piece of $\frac{3}{8}$ in. or $\frac{1}{2}$ in. dowel into a hole bored at right-angles to the direction of grain, at such a distance from the end of the wood that the thread of the wood-screw will secure a good hold in it.

These two methods will be found suitable for small, light toys where the wheels are to run on screws.

Improvements

The screw-centre described above has seen long service and done good work, but no doubt it

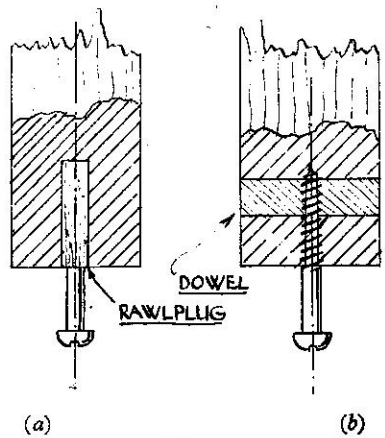


Fig. 4

could be improved. A refinement I could suggest would be to secure the wooden faceplate to the cast-iron ditto, by means of countersunk $\frac{3}{16}$ in. or $\frac{1}{4}$ in. Whit. screws, passed through countersunk clearance holes in the wood and screwed into tapped holes in the cast-iron faceplate. (See Fig. 1.) This would make it quicker and easier to dismount the wooden plate, and the tapped holes would probably be useful in securing other work to the true faceplate.

If an old chuck back-plate is knocking about, the wooden faceplate could be fastened permanently to this.

It might be advantageous for large work to use a No. 12 or 14 screw for the centre-screw, as having larger threads. It will help in gripping large work if a disc of glasspaper be glued to the face of the wooden plate, rough side outwards, which, of course, increases the friction grip.

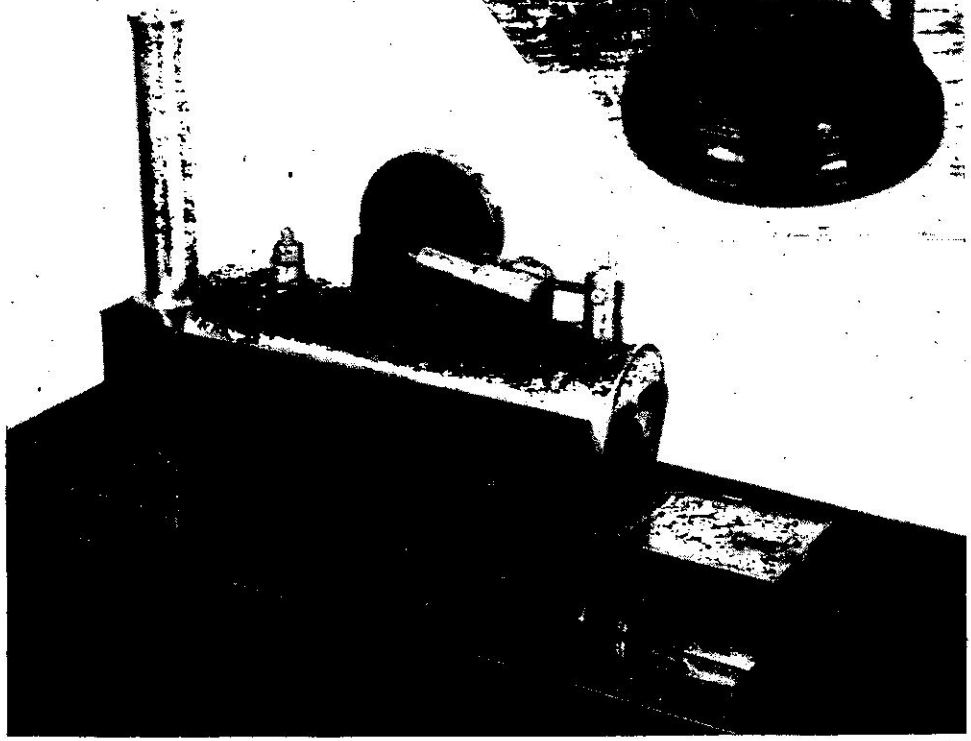
In conclusion, I must emphasise the necessity of the centre-screw being *truly* in the centre, otherwise if the partly-turned work "tightens up," or rotates slightly on the screw relative to the faceplate, as may happen under pressure of a heavier cut, the part already turned will run eccentrically. This will also happen in the case of work which is reversed on the screw (*e.g.*, the wheel described above), and, in addition, the axle-hole of the wheel would be eccentric.

Oscillating Steam Engines

ALTHOUGH the old familiar oscillating engine, with its spirit-fired pot boiler, may be regarded as a toy rather than a model, it is by no means beneath the notice of model engineers, especially those who have juvenile relations or friends whom they are anxious to encourage to take an interest in engines.

We have recently inspected two simple engines of a very familiar type, which we consider worthy of the attention of readers. One is a vertical-boilered type, with the engine attached to the side, the other having a horizontal boiler with an " overtype " engine. Both are equipped with suitable spirit lamps, and the orthodox form of safety-valve and filler cap. The construction in each case is very substantial, the boilers being in each case made from heavy solid drawn tubing, with closely-fitted and sweated end-plates. A nutted centre stay is provided in the horizontal boiler, while the vertical boiler has a large diameter centre-flue, which promotes steaming efficiency.

A rather interesting feature of these engines is the ingenious steam cock, which is of the two-way type, so that when it is shut to steam, it can be used as an oil primer for the internal lubrication of the cylinder. The engine shaft is equipped with a vee pulley for taking off a power drive. Other types of engines are in course of development. The manufacturers are Messrs. Roox Products, Wellhouse Road, Beech, Alton, Hants.



*No. 4. Saxby and Farmer's "Rocker and Grid" type. Part II

THERE are some interesting points to be noted about the lever shoe shown in Fig. 5. First of all, the main lever is 2½-in. wide, whereas the front and back tails are only 2-in. wide. The back-tail is usually fitted only on levers operating distant signals, for then the counterweight assists the signalman in starting what is often a fairly heavy pull. In passing, I might add that any reference to the "front" or "back" of an inter-locking frame usually gives rise to a certain amount of argument, some contending that the "front" is that facing the signalman; beyond saying that it is customary to refer to the supports for the distant signal lever counter-weights as *back* tails I do not intend to go. Referring again to Fig. 5, note should be taken of the angle at which the back-tail is fixed; the obtuse angle between the back-tail and the lever is necessary to give adequate clearance between the counterweight in its normal position and the longitudinal floor joists.

The Interlocking

Now we come to the interlocking proper. Fig. 6 shows a detail of one of the lock-bar supports, in which the lock bars—1-in. × ⅜-in. section—slide on edge. The particular support casting shown accommodates 8 bars, though this size can be increased to suit any particular apparatus. The interlocking mechanism is shown in Fig. 7, this particular view being taken as seen from the signalman's side of the frame. When the lever catch handle is pulled by the signalman, and the rocker oscillated, an upward travel of 1-in. is imparted to the link connected to the rocker by a universal joint; the upper end of the link is attached to a lever mounted on the locking shaft, the centre of which is shown 8⅜-in. above the base in Fig. 6. The first motion of the lever catch, through the link and lever, rotates the locking shaft through 22½ degrees; and the final motion, when the lever is set in the fully-reversed position and the catch snaps home in the notch on the quadrant, rotates it a further 22½ degrees.

Locking Shafts

In Fig. 7 the letters *N.O.P.Q.R.* and *S* denote the centre lines of the locking shafts on a number of levers. At *R* is shown a lock-bar driver. On to the lock-bar is riveted a saddle-casting carrying a stud (seen in the plan view); this stud is contained in the jaw of a forked lever, so that when the shaft is rotated, clockwise, due to the pulling of lever *R*, through the engagement of the fork and stud the lock-bar is driven in a direction from left to right, the total stroke due to the complete movement of the lever being 1½-in. The forked lever on shaft *R* is actually shown in a position corresponding to the reverse position of the lever. Associated with levers *N.P.* and *S.* are shown locking dogs, an end view of which is given in the lower view; these dogs interlock with the so-called grids, which latter are cast integral with the locking shafts. Considering lever *N*: the grid is in the position corresponding to the normal position of the lever, but owing to the presence of the dog immediately above the grid cannot be rotated, and lever *N* is thereby locked. Lever *P*, however, illustrates the case of a grid that has been released. The particular lock-bar shown relates to lever *R* which has been pulled to the reverse position; the dog above grid *P* is fixed in such a position on the bar that when lever *R* is reversed it permits the grid *P* to move. The pulling of lever *P*, it will be seen, prevents *R* from being restored to normal, so that *P* must be restored to normal first. Now if *R* were eventually restored to normal the dog above grid *N* would move 1½-in. to the right; this would release lever *N*, for the dog would take up a position, relative to the grid,

* *Continued from page* 362, "*M.E.*," *April* 11, 1946.

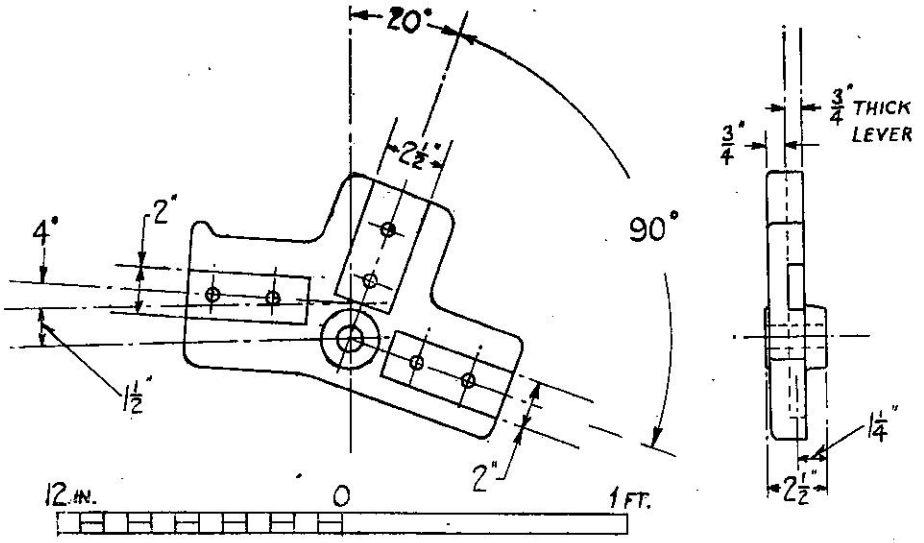


Fig. 5

similar to that shown for *S*. The dog near to grid *S* is fixed on another lock-bar and is not connected with the "driver" *R*. The converse locking can be seen by reference to grid *S*. If the shaft *S* were rotated, and the grid assumed a position inclined at 45 degrees to the horizontal (as shown at *P*), it will be seen that it would not be possible to move to the left the lock-bar on which the dog above *S* is fixed.

On the L.B. & S.C.R.

Such was the celebrated "rocker and grid" locking. In England it was perhaps most extensively applied on the L.B. & S.C.R., and Fig. 8 shows a part of the huge 280-lever frame at London Bridge, built in two portions, each back to back. This type of frame was standardised on the Belgian State railways; also, after the original English version had been installed on certain of the French railways, the Paris, Lyons and Mediterranean developed a version of their own. Perhaps the most interesting outcome of the use of this "Saxby" product overseas was in the U.S.A. At first the apparatus as described in this article was used in its entirety; then American signal engineers discarded the grid portion of the mechanism, and devised a system of tappet locking, though still actuated by the rocker and

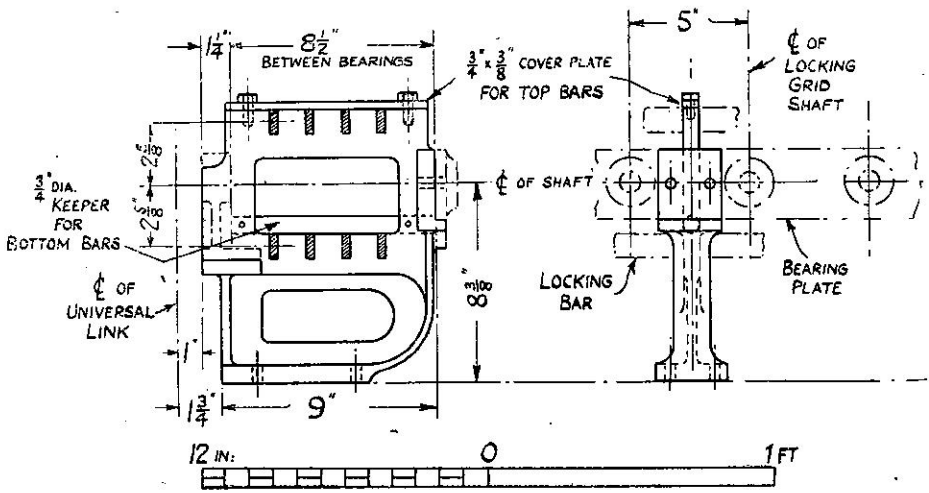


Fig. 6

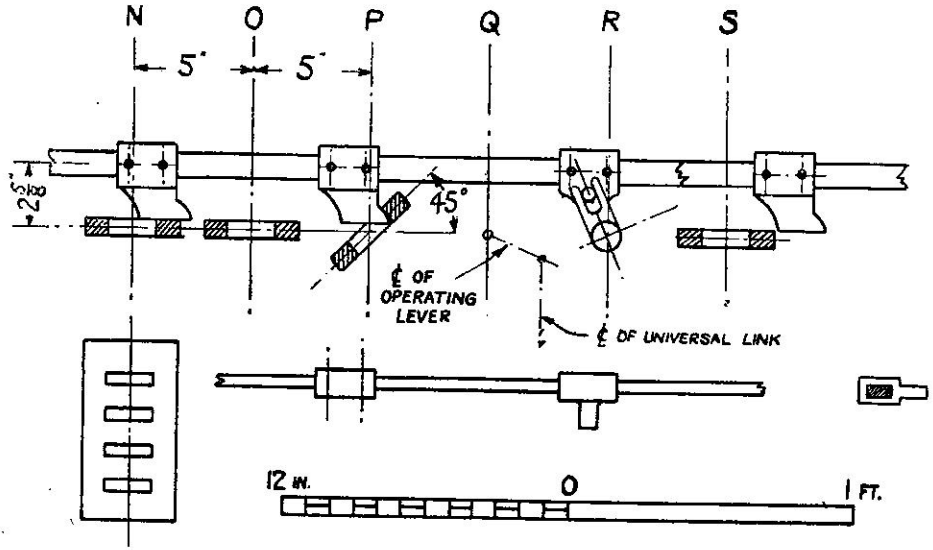


Fig. 7

universal link. Finally, to bring this "wheel" of development full-circle, this American locking, reduced to about half its original size, was adopted, and faithfully reproduced in all its details on the earliest British power frames!

(To be continued)

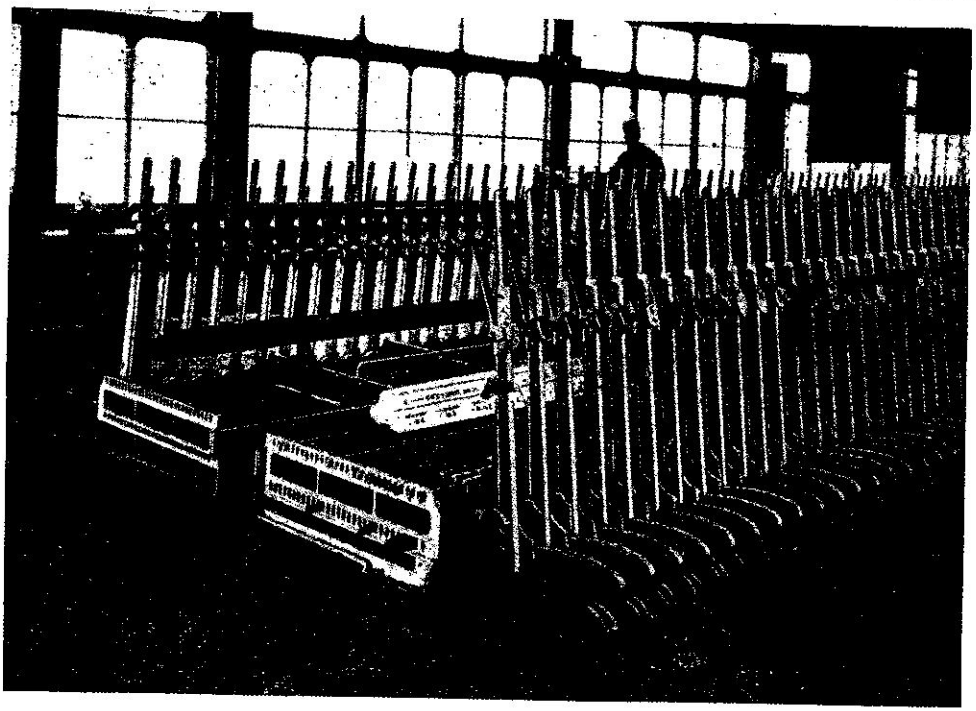


Fig. 8. The inside of London Bridge North cabin

Letters

Sound Advice

DEAR SIR,—May I say what a wonderful human document is the article by "L.B.S.C.," in THE MODEL ENGINEER for March 28th. I cannot help but believe that every word therein is the truth. It rings true to life. That must be the secret of his having such a huge following. I admire the frankness of his "one mistake in life"—such a declaration given for the sake of sincere advice to an unknown querist, must be unique.

I am not quite as old as "L.B.S.C.," but have passed through all those stages which are in the minds of his querists, and I hope he will not think me presumptuous if I say that the advice he offers only confirms that which I would have given had I been asked.

All the best "L.B.S.C." ! ! !

Yours faithfully,
"AUSTERITY"

Model Electric Traction

DEAR SIR,—Mr. Gill-Knight's letter in a recent number of THE MODEL ENGINEER to arrive here interested me very much.

Some two or three years ago, a letter appeared in, I think, *Practical Mechanics*, in which the writer mentioned an electric garden tramway he had built.

On asking for further information, I received a most courteous and detailed reply which inspired me to start collecting bits and pieces towards the construction of an experimental passenger-hauling electric locomotive.

So far, little has been done to turn the ideas I have into reality but, on my release from the Service, I intend to take up again the work already begun.

My purpose in writing is to show that there are others interested in small-gauge electric traction and to ask whether we may not occasionally be given an article on this subject?

Yours faithfully,
C. Y. BALL, F/Lt.,
Germany. Education Officer.

A "Burrell" in Shropshire

DEAR SIR,—There have been a number of interesting letters lately in THE MODEL ENGINEER about traction engines. A week or two since, being on survey work near Much Wenlock (Shropshire), I saw a Burrell traction engine driving a threshing machine at a farm. This engine appeared to have some unusual features. I had a good look at it and a chat with the driver; the following details may interest some readers.

Engine by C. Burrell & Co., Thetford, No. 2960 (this will fix the date), is a compound of the old Hornblower or Woolf type; two cylinders, H.P. and L.P. pistons, working together on one crosshead so that exhaust from H.P. front end passes direct to L.P. back end and vice versa: cylinders parallel to centre-line of engine but arranged diagonally so that piston-rods are not too far apart on crosshead, which is long and stiff. Both D-valves also work on a valve crosshead and are actuated together by a single link and two eccentrics. One crank only; stroke appeared to be about ten in. and revs. 60 or 70. Steam 170 lb. sq. in.; engine started easily from near dead centre with auxiliary H.P. valve and seemed to work well. The driver said only 5 or 6 of this type were built by Burrell. The link motion was the usual Stephensons with 4 notches in quadrant each side of centre: a brass pointer was fixed on quadrant at the second notch both front and back, possibly for best working. Size of cylinders unknown, H.P. top left and L.T. bottom right looking to chimney from crank shaft (across back of engine). I don't know much about traction engines but I hope these details may be of interest.

Yours faithfully,
Stourbridge. J. H. MCDOWELL.

An Inventor's Model

DEAR SIR,—We were particularly interested in the article by J. J. Armstrong in your issue of March 21st. Our reasons are:—(1) That the writer's forebears were at one time owners of the Fallowfield Mines. (2) That the old name of this firm was "The Ironworks."

The firm is still in being, and the name was changed comparatively recently because of the confusion caused through the present meaning of the word being different from what it meant in the past.

We are writing this because we thought it might be of interest to you, showing the dual connection of the firm and the writer with the model.

Yours faithfully,
For DAVISON & CO. (Hexham) LTD.,
EDWARD WATSON, Director.
Hexham-on-Tyne.

Books on Valve Gears

DEAR SIR,—Appropos of "L.B.S.C.'s" remarks on this subject in a recent issue, the following may be helpful to those interested in steam engine valve-gears.

H. D. R. Furman's *Valves and Valve Gears*, Vol. I, is an excellent work. (Vol. II covers. internal-combustion engine gears). In D. K. Clark's *Railway Machinery*, of 1855, will be found a most comprehensive analysis of both Stephenson and Gooch gears; and, even at that somewhat remote period, Clark was fully alive to the value of long laps and valve travels. In his later work, *The Steam Engine*, Clark not only deals excellently with the Joy gear but with Hackworth, Bremme and other radial gears, as well as the three chief link-motions.

The *Journal of the Institution of Locomotive Engineers*, Vol. XXXIII, No. 176, Nov.-Dec., 1943, contains a remarkably complete survey of locomotive valve-gears as a whole, with excellent diagrams and drawings.

Amongst the most prolific sources of information, however, are the pages of THE MODEL ENGINEER itself. Nothing sounder or more comprehensive has ever been written about the modern long-travel form of Stephenson gear, using the launch-type link, than the late G. S. Willoughby's excellent series on this subject in Vol. 77 of THE MODEL ENGINEER, and the

question of port steam pipe and exhaust pipe sizes are fully dealt with, too, in this series.

Greenly, had some excellent articles on model loco-valve-gears in Vol. 16 of THE MODEL ENGINEER, and, much more recently, some excellent articles on the Walschaerts gear.

Chas. Lake had a good descriptive article on the J. T. Marshall gear in Vol. 17 of THE MODEL ENGINEER. Carson wrote some interesting matter on Joy gear in 1909, and H. Muncaster over a long period contributed a lot of practical valve-gear information. For basic principles, Tennant's articles on "The Slide Valve," in the early volumes, could not well be bettered.

Yours faithfully,

Harrow. K. N. HARRIS.

Porosity in Gunmetal Castings

DEAR SIR,—The notes by Mr. A. J. Eyles in your issue of March 7th are, I feel, misleading in many respects and, moreover, hardly do justice to the vast amount of thought and experiment—probably far above the amount spent on, say, the design of locomotive valve-gear—which has been devoted to the problem by foundrymen, works metallurgists, research institutions, and the universities in this country and abroad.

It is not a fact that true gunmetals contain only copper and tin (alloys having these only are bronzes); they also always contain zinc and sometimes phosphorus and other metals in small amounts. More important, your readers should be warned that it is definitely not a good plan to attempt to add phosphorus to molten gunmetal. To do so (without special precautions) is most dangerous and, moreover, the results are uncontrollable. It is far safer and better to add this element in the form of a copper-phosphorus alloy, which, containing about 15 per cent. of phosphorus, is readily obtainable.

Finally, it should be noted that it is by no means certain that lead is undesirable in gunmetal. An alloy containing 83 per cent. of copper, 10 per cent. of tin, 5 per cent. of zinc, and 5 per cent. of lead has recently been shown to give very much sounder castings than Admiralty gunmetal (containing less than 0.5 per cent. of lead), and has been used with great success in producing pressure-valve parts. The addition of 5 per cent. of lead has very little effect on the strength or ductility of the metal, and it is believed that moves are on foot to persuade the Admiralty to permit such an addition to Admiralty gunmetal. Those interested should refer to a paper by Mr. Frank Hudson and to a discussion on melting and casting of bronzes, held by the Institute of Metals and the Institute of British Foundrymen in Birmingham in the autumn of 1944 (*Journal of the Institute of Metals*, August and December, 1944).

Yours sincerely,

"J. C. C."

Clubs

The Junior Institution of Engineers

Friday, April 26th, at 6.30 p.m., 39, Victoria Street, S.W.1. Ordinary meeting. "Mechanical Potato-Harvesting," by R. F. W. Guard (Durham Bursar, Associate Member).

Friday, May 3rd, at 6.30 p.m., at The Institution of Civil Engineers, Great George St., Westminster, S.W.1. The Third Stevens Memorial lecture entitled, "Processes of Destructive Hydrogenation." by R. H. Holroyd, B.Sc., Ph.D. The President, Sir George Thomson, F.R.S., will preside.

Friday, May 10th, at 6.30 p.m., 39, Victoria Street, S.W.1. Discussion Groups.

Saturday, May 18th, at 1 p.m. for 1.30 p.m. Annual Luncheon to be held at the Connaught Rooms, Great Queen Street, Kingsway, W.C.1.

Cardiff and District S.M.E.E.

At our March 20th meeting, Mr. L. W. Holland, a versatile member of ours, was prevailed upon to give an impromptu lecture on the methods he employed on the construction and brazing up of the boiler for his current model "Petrolea."

He also wound up the meeting (in another sense) with an appeal to members for their whole-hearted support in regard to the Club track. The sales, wants, and loan scheme was also inaugurated earlier in the evening.

Hon. Secretary: F. B. ANGWIN, 47, Rommilly Crescent, Canton, Cardiff.

Wicksteed Model Yacht and Power Boat Club

At a well-attended meeting held at the George Hotel, Kettering, on Monday, March 25th, Mr. E. T. Westbury, of THE MODEL ENGINEER, gave an interesting lecture on the "Latest Developments of Model I.C. Engines." A good show of engines were on the tables, ranging from 2½-c.c. to 30-c.c., also castings and part-finished engines belonging to members. Mr. Westbury had with him several types of his miniature magnetos, and a trial run was made with a 6-c.c. two-stroke, fitted with the original magneto, still in great form. A compression-ignition engine was also given a run. Questions followed and a general get-together talk finished an enjoyable evening. Hon. Secretary: H. C. WARD, 20, College Street, Irthlingborough.

Bradford and District Model Power Boat Club

The Club has now re-commenced activities, and the lake is available on Saturday afternoons until Easter, when we revert to Thursday evening sailing for the summer months. A Business meeting will be held in the Boat-House, Bradford Moor Park, on Thursday, April 25th, at 7 p.m. Will all members make a special effort to attend? Anyone interested in the activities of the Club are requested to get in touch with the Hon. Secretary: K. DALBY, 51, Springfield Road, Baildon, Yorks.

Whitefield Model and Engineering Society

At our last meeting, held on March 22nd, we were visited by Mr. Proud, of Hull. He gave us a very interesting talk on Italian Railways, having recently been released from a railway operating unit serving in Italy.

Descriptions of Italian locomotives were given, and photographs passed round. Mr. Proud told us about driving these locomotives, and the unit's work in rebuilding railways destroyed by the Germans.

We will be very pleased to welcome Mr. Proud again some time. Our next meeting is on April 19th, at 7.30 p.m.

Hon. Secretary: A. STEVENSON, 2, Newlands Drive, Prestwich.

Harrow Society of Model Engineers

The Harrow Society of Model Engineers are holding their seasonal opening on Easter Monday, at "The Grange," Kenton, and will be pleased to receive any visitors from other societies.

Hon. Secretary: A. D. POLE, 13, Churchfield Close, Woodberry Avenue, Nr. Harrow.

The Bristol Society of Model and Experimental Engineers

Our meeting on Thursday, March 14th, was held at our new premises, St. Nicholas' Parish Hall, Trinity Place, off Trinity Street. Mr. L. F. Redman's talk on "Machine Drawing and Reading Same," was well received by members.

Our meeting on March 28th was well attended and a very interesting discussion was given by Mr. A. W. Anstey on "How to Equip a Workshop with Small Tools"; we had the pleasure of examining Mr. Anstey's layout of the actual lathe and subsidiary equipment he uses for model engineering.

Hon. Secretary: C. C. LUCY, 28, Bibury Crescent, Henleaze, Bristol.

The Model Power Boat Association

A special general meeting will be held on Saturday, April 27th, at the offices of the Junior Institution of Engineers, 39, Victoria Street, London, S.W.1, commencing at 3 p.m.

The object of the meeting is to discuss the reorganisation and future activities of the Association, and other matters of vital interest to all concerned with the building and running of all types of model power boats.

It is hoped that all clubs formerly affiliated to the Association will be represented, and an invitation is also extended to representatives of all model power boat clubs, or model engineering societies interested in this subject.

All communications should be made to the Hon. Secretary: EDGAR T. WESTBURY, 10, Oakhurst Rise, Carshalton Beeches, Surrey.

Glasgow Society of Model Engineers

The next meeting will be held within the Society Rooms, on Saturday, April 27th, 1946, at 7.30 p.m., and will be devoted to the task of the locomotive section and its work upon the new track site. In the afternoon of the same day, as from 3 p.m., all members of the Society are invited to visit White's works, at Rutherglen —take 10 or 18 tram from city—to see for themselves the progress, and the work still to accomplish. Provisionally, we hope to have The Editor of THE MODEL ENGINEER, J. N. Maskelyne, present on September 14th, to open same, and this date is a challenge and an incentive to urge on this important piece of construction.

Hon. Secretary: JOHN W. SMITH, 785, Dumbarton Road, Glasgow, W.1.

Malden and District Society of Model Engineers

The Malden Society will be holding a first exhibition in Wimbledon, on Friday and Saturday, April 19th and 20th, at the Queens Hall, Queens Road, Wimbledon, from 11 a.m. to 9 p.m. each day.

The Queens Hall is immediately behind the Town Hall, Queens Road being on the right-hand side, facing the Town Hall, about one minute from Wimbledon Station—Southern Railway and District Line of the L.P.T.B., tram and trolley-bus terminus and motor-bus stops.

All model engineers are cordially invited to this show, which promises to beat all previous records both for number and variety of exhibits.

Exhibition Organiser: A. L. HEADECH, 17, The Park, Carshalton, Surrey. Hon. Sec. of Society: G. F. TONNSTEIN, 7, Thetford Road, New Malden. Assitant Hon. Sec. of Society: G. T. TOLLETT, 9, Chilmark Gardens, New Malden, to whom all enquiries re membership should be sent.

Birmingham Society of Model Engineers

The next meeting will be held on Wednesday, May 8th, at the White Horse, Congreve Street, Birmingham, at 7 p.m.

Easter Monday, April 22nd, will be a "Track Day" at the track at Western Road, 2 p.m.

Hon. Secretary: WILF. H. KESTERTON, 31, Wood Green Road, Quinton, Birmingham.

Mansfield and District Model Engineering and Handicrafts' Society

At the annual general meeting of the above Club at Messrs. Morley's Canteen, Penn Street, Sutton-in-Ashfield, the yearly election of officers for the forthcoming year was held. The workshop in Bown Street, is now ready for the Electric Power Company's putting a service cable in. Mr. F. Pearson is bringing his 5-in. lathe along to be installed in the workshop, which is a two-storey building, workshop downstairs, and projected reading room and drawing office upstairs.

Hon. Secretary: J. CORBETT (Lathes), Stanton Hill, Nr. Mansfield. Tel. 583, Sutton-in-Ashfield.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects, which should be addressed to him at Cordwallis Works, Maidenhead, Berks. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall and Co. Ltd., 23, Great Queen Street, London, W.C.2.

Correspondence relating to display advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 23, Great Queen Street, London, W.C.2.

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Lathes. Build your own Toy and Model Maker's Lathe from easily obtainable parts *only* (costing about 50s.). Set of clear diagrams (6) and instructions for making all parts easily—including alternative types of chuck, headstock, etc. No machining needed. Price 3s. 3d.—M. BARHAM, La Hougue, Vale, Guernsey, C.I. (posted promptly).

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Electradix Bargains include:

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Transformers, 3 K.W. Crypto, 230 volts to 115 volts, 28 amps., £9 10s., to small Bell Transformers, 230/3/58 volts, 7s. 6d. Transformers for Rewind, 3 K.W. with stampings, 4½" × 6" × 7½", windings damaged by blitz, weight with damaged wire, 65 lb., 45s., carriage extra.—ELECTRADIX, 214, Queenstown Road, London, S.W.8.

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POPULAR TAPS AND DIES

Thread ...	1/16"	3/32"	1/8"	5/32"	3/16"	7/32"	1/4"	9/32"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"
Whit. and B.S.F. Per Tap ...	1/6	1/6	11d.	11d.	11d.	11d.	11d.	1/3	1/3	1/6	2/0	2/3	2/9	3/3
Per Die ...	3/0	3/0	2/0	2/0	2/0	2/0	2/0	3/0	3/;	3/0	5/3	5/3	5/3	8/0
B.S. Brass Per Tap ...	—	—	—	—	—	—	1/0	—	1/6	2/0	2/6	2/9	3/6	4/0
Per Die ...	—	—	—	—	—	—	2/6	—	4/0	4/0	7/3	7/3	7/3	10/6
American Fine or Coarse Per Tap	—	—	—	—	—	—	1/2	—	1/7	1/11	2/6	2/10	3/6	4/0
Per Die ...	—	—	—	—	—	—	2/6	4/0	4/0	4/0	7/3	7/3	7/3	10/6
M.E. 32-Thread Per Tap ..	—	—	—	—	1/9	1/9	1/9	2/0	2/0	2/3	2/9	3/0	—	—
Per Die ...	—	—	—	—	2/6	2/6	2/6	4/0	4/0	4/0	7/3	7/3	7/3	10/6
M.E. 40-Thread Per Tap ..	—	—	11d.	1/9	1/9	1/9	1/9	6/3	3/0	3/6	3/9	4/0	—	—
Per Die	—	—	2/0	2/6	2/6	2/6	2/6	4/0	5/0	5/0	10/3	10/3	—	—

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Per Die ...	2/0	2/6	3/0	4/9	5/9	6/6

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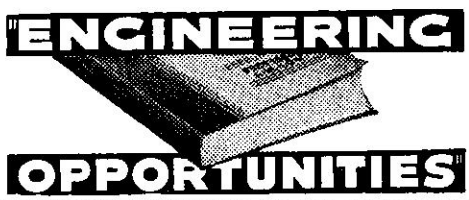

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